

Program & Abstract Book



17th World Lake Conference

(Lake Kasumigaura, Ibaraki, Japan 2018)

Harmonious Coexistence of Humans and Lakes

-Toward Sustainable Ecosystem Services-



Date October 15 (Mon.) – 19 (Fri.), 2018

Venue Tsukuba International Congress Center

Host Organizations



Ibaraki Prefectural
Government



The International Lake Environment
Committee Foundation (ILEC)

Co-Hosts

Ministry of Land, Infrastructure, Transport and Tourism (MLIT) , Ministry of the Environment (MOE) ,
Ministry of Agriculture, Forestry and Fisheries (MAFF) , Tsuchiura City , Tsukuba City , Kasumigaura City ,
Hokota City , Ibaraki Town , Mito City , Council to Improve the Water Quality of Lake Kasumigaura ,
The Association of Lake Hinuma, Registered Ramsar Site

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Messages



Governor, Ibaraki Prefecture
Chair, Executive Committee of the 17th World Lake Conference
Kazuhiko Oigawa

It is truly a delight and a great honor to host the 17th World Lake Conference (Lake Kasumigaura, Ibaraki, Japan, 2018) in Ibaraki Prefecture.

I would like to extend a hearty welcome to all participants.

Ibaraki Prefecture is blessed with a rich natural environment, including Lake Kasumigaura, which is Japan's second largest lake, and Lake Hinuma, which is a designated Ramsar site.

The prefecture is also home to various thriving industries. Tsukuba, for instance, is a focal point for some of the world's most advanced science and technology. There are also industrial clusters in the Hitachi and Kashima districts. Additionally, there are Ibaraki's agriculture, forestry, and fishing industries, nurtured by vast, fertile farmlands and a rich natural environment.

Ibaraki Prefecture has many lakes and wetlands, including Lake Kasumigaura. More than just sources of water for drinking, industry, and agriculture, lakes also play an important role in our daily lives, as places for recreation and as places for us to feel at peace.

Water forms the basis of all life, and we have enjoyed the blessings of ecosystem services derived from lakes. However, many of the world's lakes are now facing a raft of problems, including the loss of biodiversity and the negative effects of climate change.

The 17th World Lake Conference is based on the theme "Harmonious Coexistence of Humans and Lakes -Toward Sustainable Ecosystem Services." It aims to bring together a wide range of people involved in lakes and wetlands, including residents, people engaged in agriculture, forestry and fisheries, business owners, researchers, and government officials, in order to share information and to exchange ideas about what measures must be taken for us to continue to sustainably enjoy the benefits of ecosystem services. It is hoped that this conference will serve as a catalyst for people in a variety of positions to become more aware of their respective roles and that it will strengthen cooperation among them, leading to the development of new solutions for lake-related issues.

My great hope for the conference is that it might help sustain the blessings we receive from lakes and that it might open up a brighter future for lakes and those that use them.



Vice-Chair, Executive Committee of the 17th World Lake Conference
President, International Lake Environment Committee Foundation (ILEC)
Kazuhiko Takemoto

The World Lake Conference (WLC) is recognized as a global forum for a wide range of stakeholders to exchange views and experiences on the sustainable management of lakes and their basins, exploring the best solutions to common issues. I am pleased and honored to welcome you to 17th WLC here in Ibaraki, together with the members of the Organizing Committee. I would like to extend special thanks to them for organizing 17th WLC in such a smooth and effective manner.

In recent years, sustainability and resilience have become issues of high priority across the world, and the international community is now implementing the "2030 Agenda for Sustainable Development" including the Sustainable Development Goals (SDGs), adopted by the UN General Assembly in 2015. We must all take action to contribute towards achieving the goals, and in particular, to Goal 6 on water and sanitation, Goal 15 on terrestrial ecosystems, and Goal 17 on partnerships.

Bearing in mind the theme of 17th WLC, "Co-existence of human beings and the lakes: toward sustainable ecosystem services," this conference will be an opportunity to deepen discussions on measures to improve lake basin management and on the roles of various stakeholders. These discussions will contribute to global efforts to implement the 2030 Agenda, and at the same time to exploring possible solutions to relevant challenges.

I wish you all a successful conference and strengthened partnerships, with active participation in all of the sessions and events - as well as a pleasant stay in the wonderful setting of Ibaraki.

1 Conference Aim

Water forms the basis of all life, and a variety of ecosystems that include humans have benefited greatly from it. Lakes are an invaluable resource for agriculture and fisheries, for industry, and for our culture, and the conservation of lake environments is of the utmost importance.

The 6th World Lake Conference, held in Ibaraki in 1995, adopted the theme “Harmonizing human life with lakes - toward the sustainable use of lakes and reservoirs”. Lake use, environmental conservation, the securement and management of freshwater resources, and the effects of eutrophication and chemical substances were discussed, and opinions exchanged with the aim of striving for harmony between humans and lakes.

Furthermore, as a result of placing a focus on the undertaking of aquatic environment conservation activities and environmental education, a large number of river basin residents and citizens’ organizations participated in the conference, triggering an increase in citizen activities. Since the conference, a partnership between citizens, researchers, businesses, and government bodies has formed the basis of ongoing efforts to solve issues surrounding aquatic environments.

In recent years, topics related to ecosystems have been discussed at the World Lake Conferences. In 1992, The Convention on Biological Diversity was adopted based on the fact that biodiversity supports human existence and brings a variety of benefits to humanity, and plants and animals have no national borders so it is important that issues surrounding ecosystems are tackled globally. Countries around the world are mutually cooperating in research and information exchange.

Meanwhile, the Basic Law for Water Circulation came into force in Japan in July 2014 with the aim of comprehensively and integrally promoting policies concerning the water cycle in order to reassert that water is a resource that all humanity shares, to allow water to circulate healthily, and so that humanity can continue to enjoy the blessings that it brings. The law is based on fundamental concepts including the importance of the water cycle and integrated lake basin management, and establishes the respective responsibilities of local public organizations, businesses, and citizens, and the coordination and cooperation that should occur among them.

Humans have enjoyed the blessing of ecosystem services such as food and water supplied by ecosystems built on biodiversity. However, development activities and climate change have caused a drastic loss in biodiversity. At the 17th World Lake Conference, we will discuss how ecosystems can be maintained through greater conservation efforts – namely, the development of a society where humans and lakes can support each other and coexist in harmony. Furthermore, information sharing and opinion exchange around what measures need to be taken in order for humans to continue to sustainably enjoy ecosystem services will be held among people involved with lakes, including residents, those engaged in agriculture, forestry, and fisheries, businesses, researchers, and government agencies.

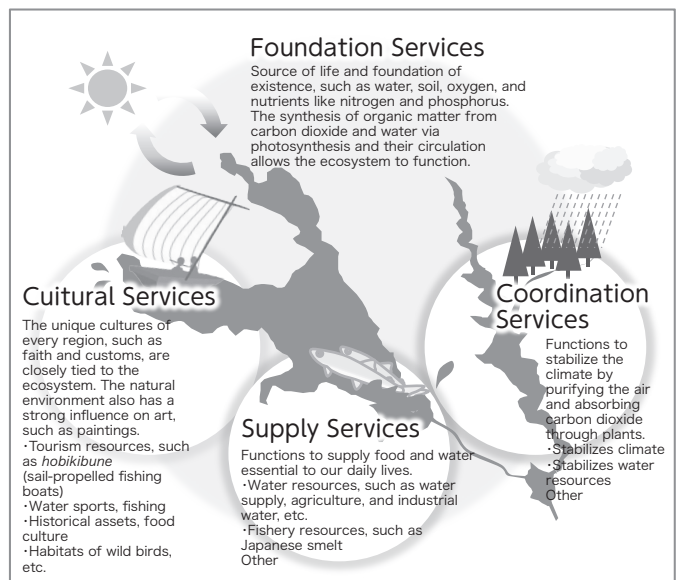
This conference is hoped to be a trigger for a variety of people to strengthen coordination with each other based on their individual responsibilities, bringing about new progress in the solving of lake-related issues.

What are Ecosystem Services?

Ecosystems function as the foundation for plants to utilize sunlight to produce carbohydrates (organic matter) through photosynthesis.

Ecosystems are host to diverse organisms and are connected by complex food webs and food chains. Humankind is also one of a great number of creatures connected to the ecosystem.

In other words, ecosystems are our natural surroundings. Our lifestyles, culture, and daily life are supported by the bounties we gain from the ecosystem, such as our food and water supply, stable climate, and other sustenance from the earth. These blessings of nature are called “ecosystem services” and can be divided into four types, as shown in the figure below.



2 Outline of Conference

Theme	Harmonious Coexistence of Humans and Lakes -Toward Sustainable Ecosystem Services-
Conference Period	October 15 (Mon.) - 19 (Fri.), 2018
Venue	Tsukuba International Congress Center, others
Language	English / Japanese English/Japanese simultaneous interpretation is available in all program
Host Organizations	Ibaraki Prefectural Government, The International Lake Environment Committee Foundation (ILEC)
Co-Hosts	Ministry of Land, Infrastructure, Transport and Tourism (MLIT) / Ministry of the Environment (MOE) / Ministry of Agriculture, Forestry and Fisheries (MAFF) Tsuchiura City / Tsukuba City / Kasumigaura City / Hokota City /Ibaraki Town / Mito City / Council to Improve the Water Quality of Lake Kasumigaura / The Association of Lake Hinuma, Registered Ramsar Site
Supported by	United Nations Environment Programme / UNDP Representative Office in Tokyo / Headquarters for Water-Cycle Policy / Ministry of Foreign Affairs / Science Council of Japan / Japan Water Agency / Shiga Prefecture / Ibaraki Association of City Mayors / Ibaraki Association of Towns and Villages / Ibaraki Association of Chairpersons of City Councils / Ibaraki Prefectural Association Chairmen of Town and Village Assemblies / Ibaraki River Association / Ibaraki Federation of Women's Organizations / Ibaraki Liaison Committee of Regional Women's Organizations / Challenge Ibaraki- Residents Movement/ 2018 Citizen's Association that works closely with the World Lake Conference / Ibaraki University / University of Tsukuba / National Agriculture and Food Research Organization / Public Works Research Institute / National Institute for Environmental Studies / Japan Science and Technology Agency / The National Institute of Advanced Industrial Science and Technology (AIST) / Japan Society of Civil Engineers / Japanese Society of Irrigation, Drainage and Rural Engineering / The Japanese Society of Fisheries Science/ Japan Water Works Association / The Institution of Professional Engineers, Japan / Japanese Association of Groundwater Hydrology / Japan Sewage Works Association / Japan Society on Water Environment / Japan Geoscience Union / Japanese Society of Soil Science and Plant Nutrition / The Ecological Society of Japan / The Remote Sensing Society of Japan / Association of Japanese Agricultural Scientific Societies / The Japanese Society of Limnology / Society for Environmental Economics and Policy Studies / Ecology and Civil Engineering Society / The Japan Wetland Society / The Japanese Society for Environmental Education / The Ibaraki Shimbun / The Mainichi Newspapers / The Yomiuri Shimbun / Tokyo Shimbun (Mito Branch), Kyodo News / Nikkei Inc. (Mito Brunch) / NHK (Mito Station) / IBS Co., Ltd. / The Nikkan Kogyo Shimbun

3 Access Information

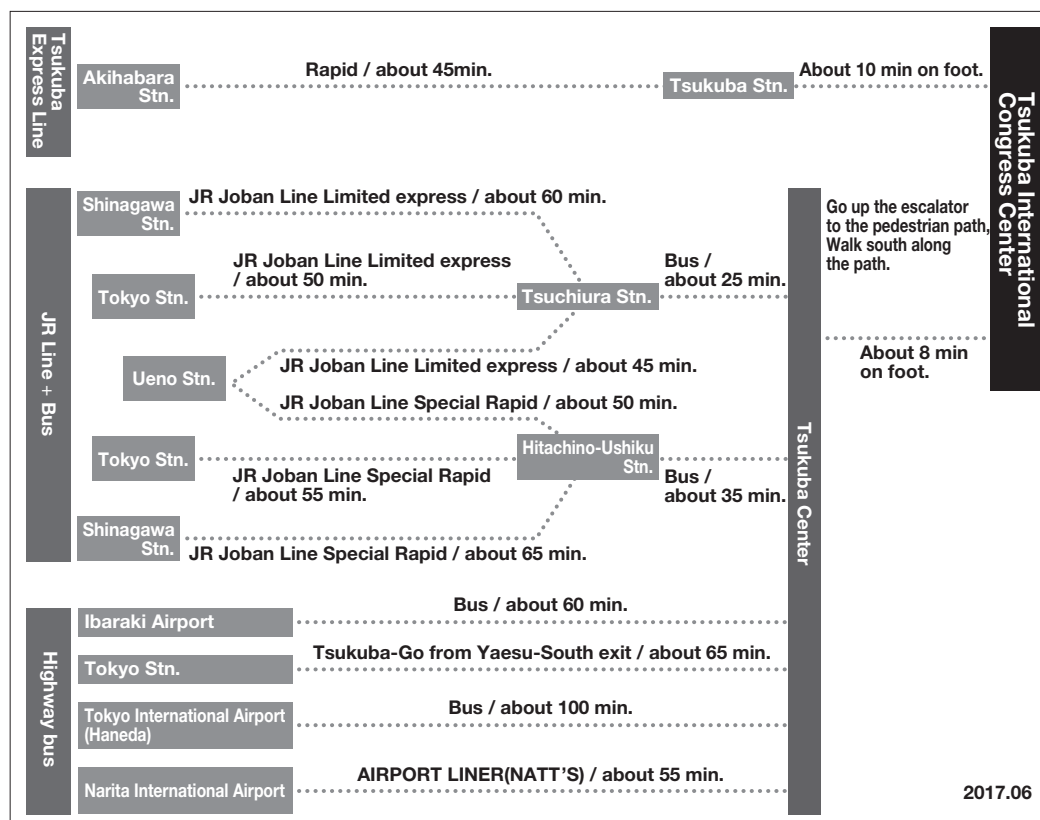
(1) Venue

Tsukuba International Congress Center

2-20-3, Takezono, Tsukuba, Ibaraki, 305-0032, Japan



(2) Train and Bus Information



2017.06

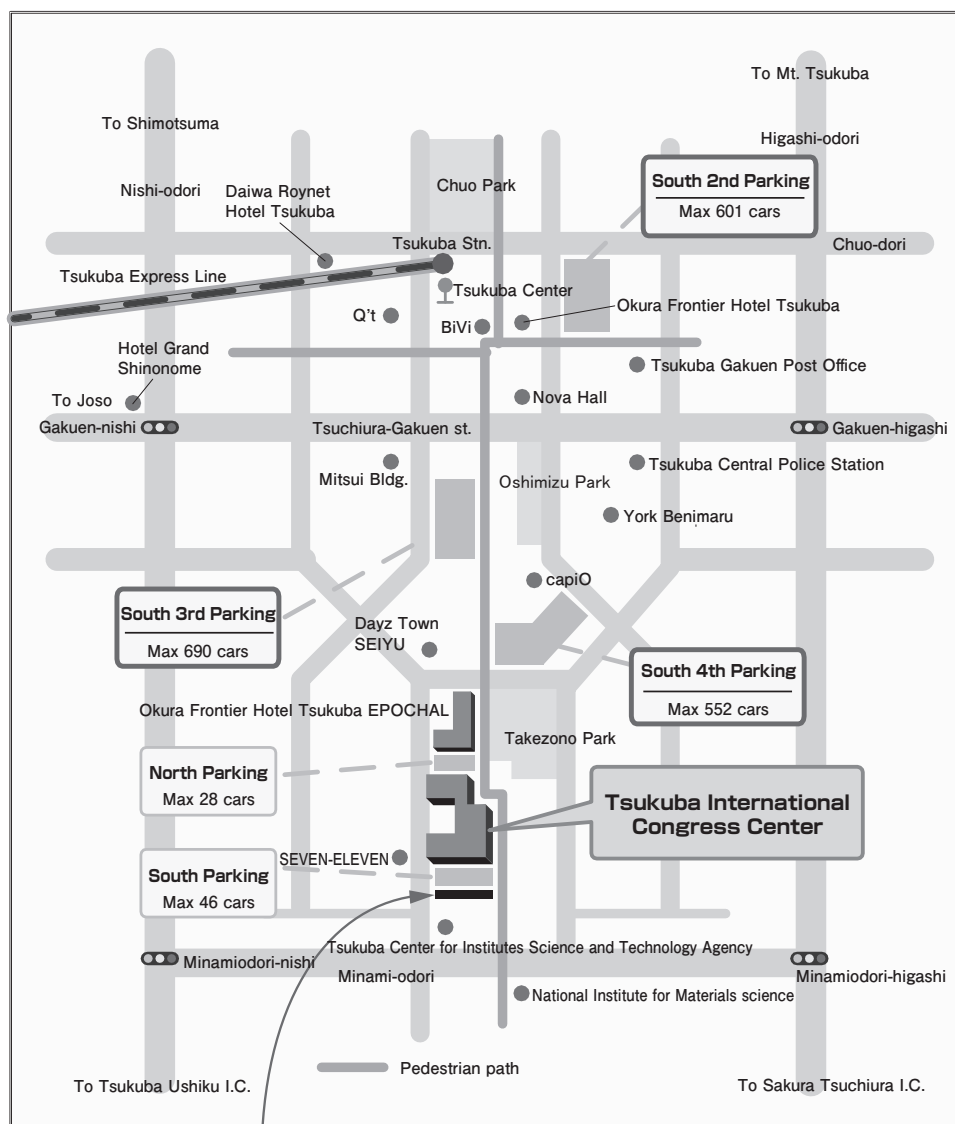
(3) Information on nearby parking lots

Please use the nearby paid parking lots indicated by the bold red border (South 2nd, South 3rd and South 4th Parking). Please do not park at the Tsukuba Center for Institutes or at nearby stores.

For further details on nearby parking lots, please see the Tsukuba Urban Transportation Center (TUTC) website

TUTC website: <https://www.tutc.or.jp/carpark>


* Parking spaces are limited, so please use public transportation wherever possible.



※ There is a hedge here.
Please do not park at the Tsukuba Center for Institutes or at nearby stores.

4 Conference Schedule

Venue	Tsukuba International Conference Center				
Date	October 14 (Sun.)	October 15 (Mon.)		October 16 (Tue.)	
8:00		8:00- Registration		8:00- Registration	
8:30					
9:00	9:00- Registration		9:00-17:00	9:00-12:00	9:00-17:00
9:30				9:30-12:00	
10:00	10:00-10:15 Opening Ceremony for Student Conference				
10:30	10:20-12:00 Student Conference Research and Activity Presentation (Convention Hall 200, 300, Main Convention Hall)	10:15-10:30 Opening Performance		Policy Forum (Main Convention Hall)	Technical Sessions
11:00		10:30-11:30 Opening Ceremony (Main Convention Hall)			
11:30		11:30-11:50 Ibaraki Kasumigaura Award Ceremony			
12:00					
12:30					
13:00	13:00-14:30 Student Conference Poster Session (Conference Room 101, 102)	13:10-14:10 Keynote Speech (Main Convention Hall)	Exhibition (Multi-Purpose Hall)	13:10-17:15	Exhibition (Multi-Purpose Hall)
13:30					13:00-14:00 Technical Sessions Poster Presentation (Conference Room 101, 102)
14:00					14:00-17:00
14:30		14:30-17:00			
15:00	14:45-16:00 Student Conference Discussion (Conference Room 101, 102)	Lakes Session (World Lakes Session) (Main Convention Hall)		Lakes Session (Japanese Lakes Session) (Main Convention Hall)	Technical Sessions
15:30					
16:00					
16:30	16:15-17:00 Closing Ceremony				
17:00					
17:30					
18:00	18:00-20:00 Welcome Party ("Shinonome", Hotel Grand Shinonome)	18:00-20:00 Reception		18:00-20:00 Workshop	
18:30					
19:00					
19:30					
20:00					

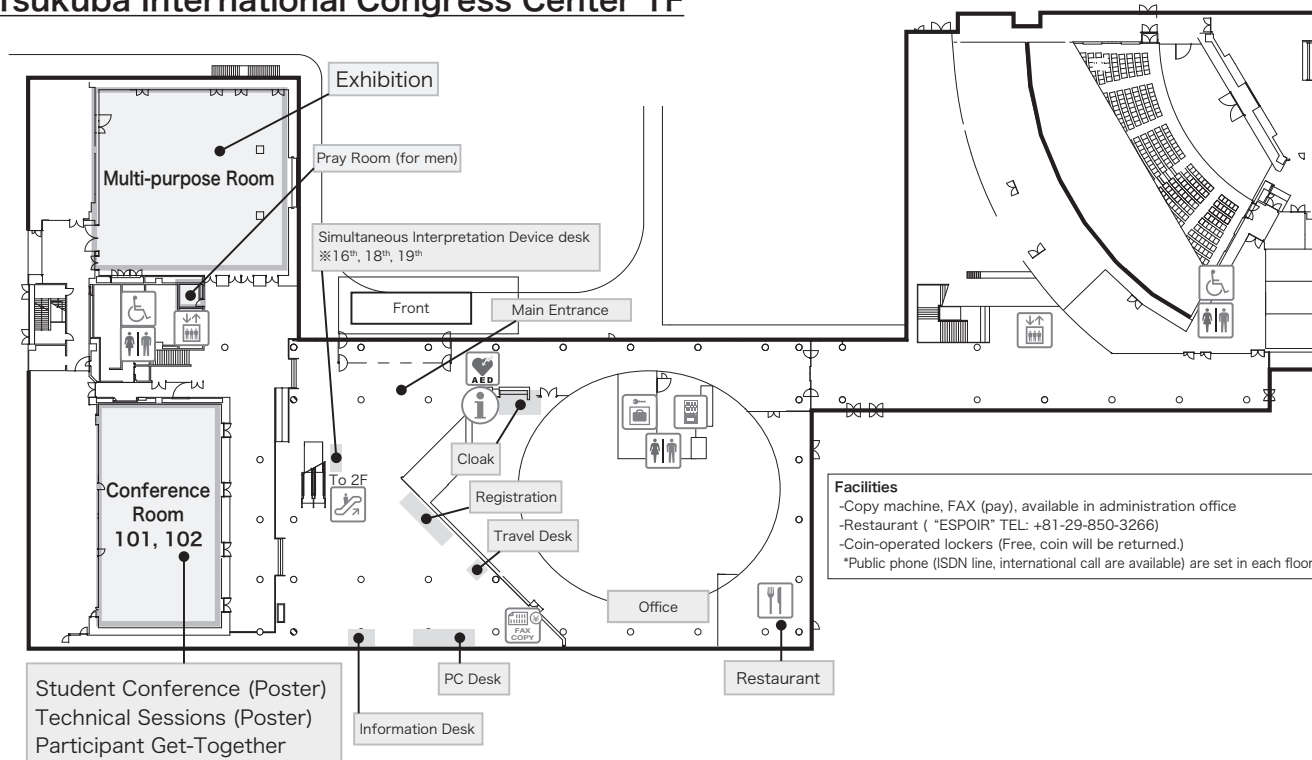
	Tsukuba International Conference Center				Venue
October 17 (Wed.)	October 18 (Thur.)			October 19 (Fri.)	Date
7:00- Registration					8:00
8:00-17:30	8:00- Registration				8:30
Excursion (Kasumigaura Course)  Excursion (Kitaura, Hinuma, Lake Senba Course)		9:00-12:00	9:00-17:00	9:00- Registration	9:00
	9:30-11:55	Technical Sessions	Exhibition (Multi-Purpose Hall)		9:30
	Kasumigaura Session (Main Convention Hall)			10:00-12:00	10:00
				Conference Summary (Main Convention Hall)	10:30
				Exhibition (Multi-Purpose Hall)	11:00
	12:00-14:00				11:30
	Kasumigaura Session Poster Presentation (Foyer of Main Convention Hall)	13:00-14:00 Technical Sessions Poster Presentation (Conference Room 101, 102)			12:00
					12:30
	14:05-17:00	14:00-17:00		13:00-14:00 Closing Ceremony (Main Convention Hall)	13:00
					13:30
					14:00
					14:30
					15:00
					15:30
					16:00
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					17:00
					17:30
18:00-20:00	18:00-20:00				18:00
					18:30
					19:00
					19:30
					20:00

Exhibition of Activities by Hosts
Core Time:
Oct. 18 (Thur.) 11:00-14:00

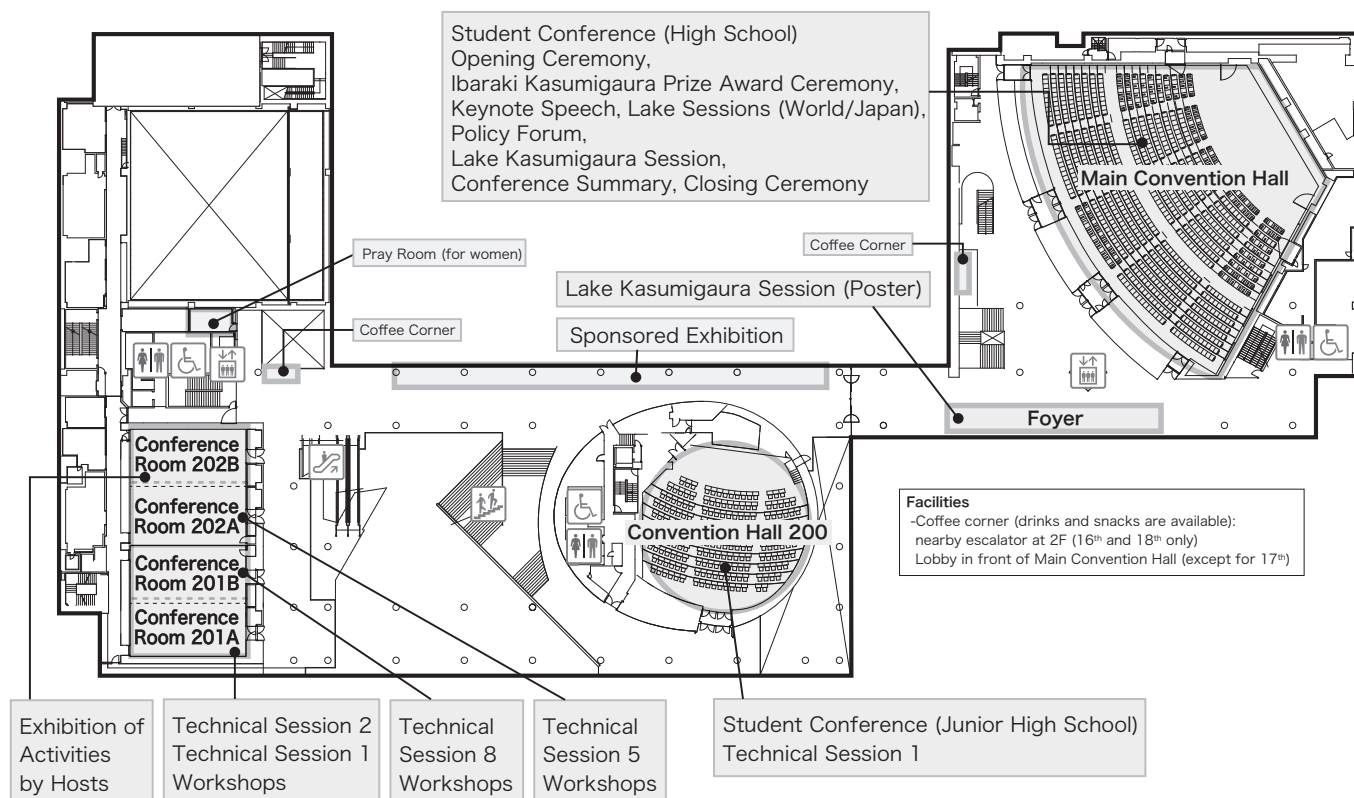
5 Venue Information

(1) Floor Map

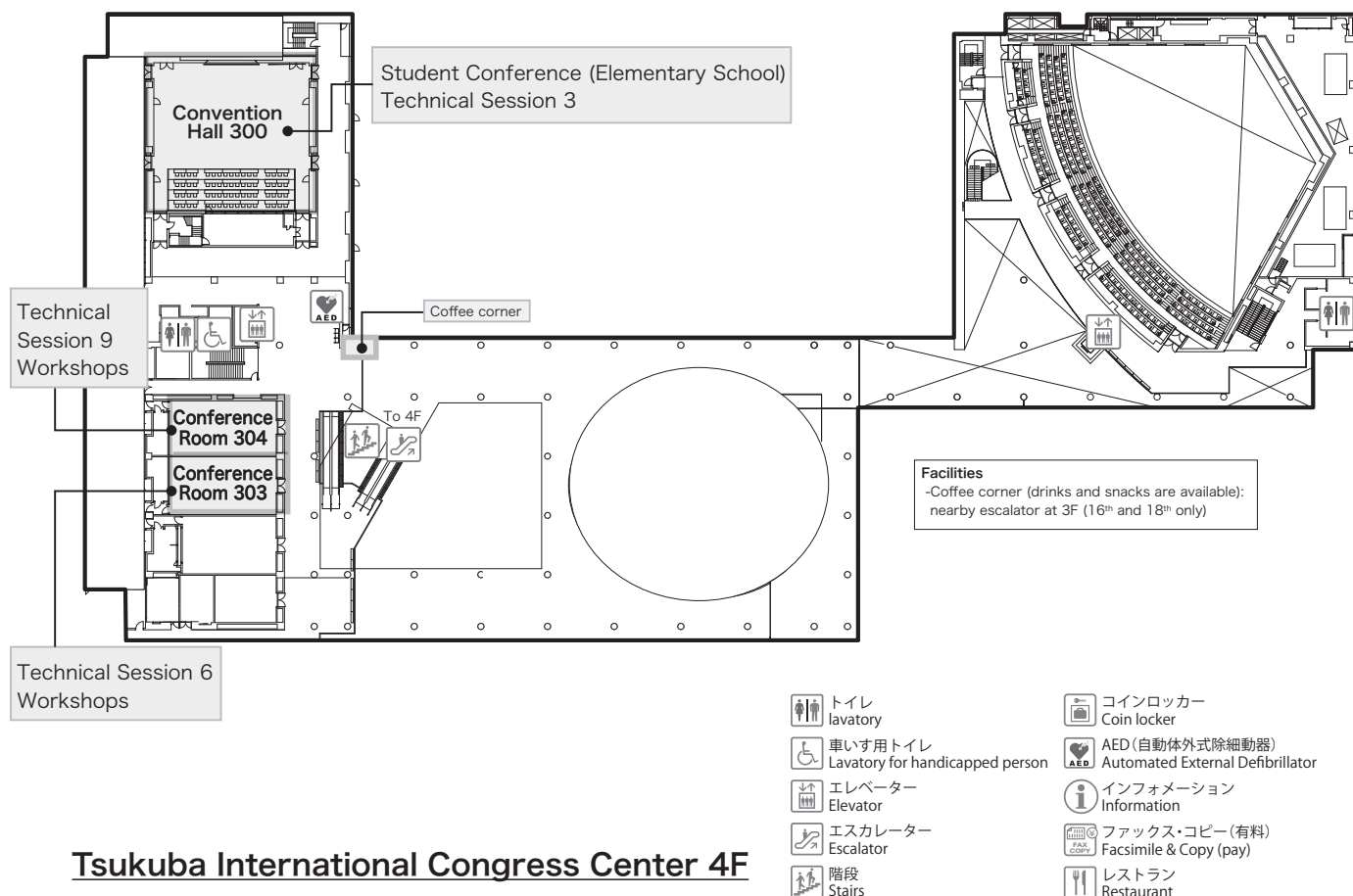
Tsukuba International Congress Center 1F



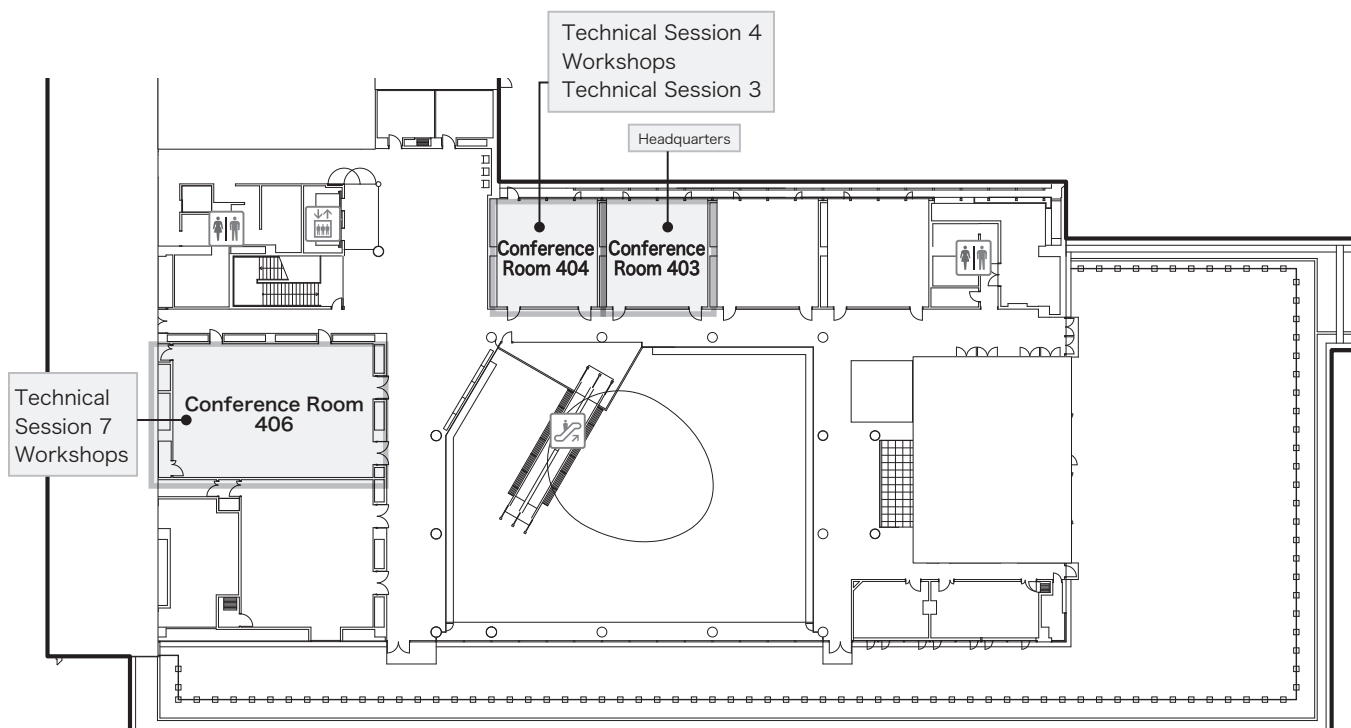
Tsukuba International Congress Center 2F



Tsukuba International Congress Center 3F



Tsukuba International Congress Center 4F



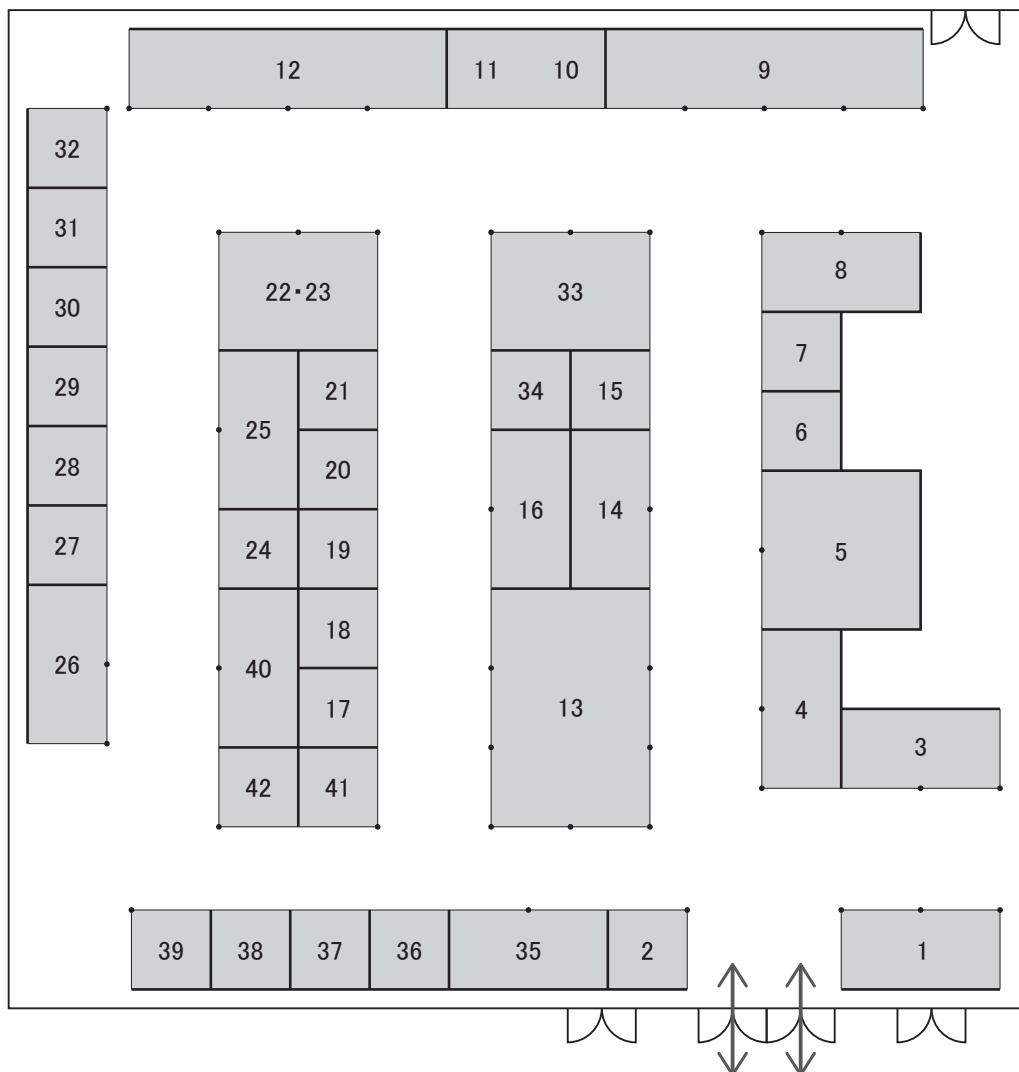
(2) Exhibition

Date & Time October 15 (Mon.)-October 19 (Fri.) (Except for 17 (Wed.)) 9:00-17:00

*By 13:00 on October 19

Venue Multi-purpose room, Tsukuba International Congress Center

Outline Companies and research institutes will exhibit their activities and studied cases on “Monitoring Based on Scientific Knowledge” and “Countermeasures and Technologies for Sustainable Use of Ecosystem Services”.



Exhibitors' List

Booth No.	Exhibitor	Contents
1	Shiga Prefectural Government	Lake Biwa conservation and restoration initiatives by the Shiga Prefectural Government and other organizations, such as cities, towns and NPOs in Shiga, will be introduced through posters, pamphlets, videos, etc.
2	OMITAMA City Office	Our city is called “diamond city” because diamond tsukuba can be seen from the omitama city. The theme of our presentation are the wonderful kasumigaura view and the history. Would you like to study about kasumigaura that Japan boasts to the world?

Booth No.	Exhibitor	Contents
3	Geospatial Information, Authority of Japan	Various kinds of geospatial information provided by Geospatial Information Authority of Japan(GSI) can be helpful to the efforts promoted precisely, quantitatively and visually for Lake Kasumigaura. We will introduce the Lake Dataset, time series of aerophotographs and topographic maps and so on regarding Lake Kasumigaura.
4	National Institute for Environmental Studies	Since 1976, we have been monitoring water quality, sediment, plankton, and benthos in Lake Kasumigaura. We have also investigated other Japanese lakes, including Lake Biwa, for the conservation of water quality and lake ecosystem. We offer guests the chance to see our survey tools and methods, and to learn about what our institute is doing at Lake Kasumigaura and Lake Biwa.
5	National Agriculture and Food Research Organization (NARO)	The impact of agricultural activities on aquatic ecosystems and water quality, and those appropriate management methods will be introduced. The presentation will focus on invasion of foreign organisms and efficient countermeasures, conservation of biodiversity, dynamics and environmental impacts of fertilizer, livestock wastewater treatment technology, and risk assessment of pesticides.
6	Forestry and Forest Products Research Institute	The Forestry and Forest Products Research Institute (FFPRI) exhibits some research activities, particularly studies in relation to biodiversity in riparian ecosystem and behavior of radioactive materials in forest ecosystem for public concerns.
7	The Japan Institute of Wastewater Engineering and Technology (JIWET)	We will introduce to "Two-axis management" which enables optimal management from both viewpoints of treated water quality and energy consumption, and "Effective disinfection methods under wet weather condition" in sewerage treatment plants, etc. by posters and leaflets.
8	University of Tsukuba	We will introduce the Tsukuba 3E Forum. This forum was collaboratively organized by universities, research institutes, and municipalities in 2007 with the aim of tackling research that establishes Tsukuba as an energy-saving, low-carbon city of science. The goal is to "reduce CO2 emissions by 50% in Tsukuba by 2030" while balancing the "3Es" of Environment, Energy, and Economy. Also, we will exhibit "Aquaponics" which is considered as the next generation agricultural system, and environmental education material.
9	Ibaraki University	We will introduce the educational and research activities of water environment through the exhibition composed of 4 themes; 1) Overview, 2) Fish fauna of Lake Kitaura : including extinct, endangered and alien fishes, 3) The history of lakes in Ibaraki and our research, 4) Experience of field survey.
10	econet Ibaraki by Tokiwa University Matsubara seminar & Mito Eiko junior high school science club	econet ibaraki · tokiwa university · mito eiko Junior high school. Implementing the animal magnet eco work Exhibition firefly playback panel of the Minister of the Environment Award.
11	Sakasagawa Children's Eco Club with Maruta co	Alien species fishing game that inhabit the lake! Fished When the minion's goods, Mito Holly hock goods or the like as a prize & Children's environmental protection panel exhibition
12	Environment Management Association Ibaraki	Introduction of environmental burden reduction activities (utilization of waste energy, shielding coating, underground heat utilization system, carbon offset products, LED products, recycled clay logo experience, eco consult) and water purification (Aoko sedimentation experiment) etc.

Booth No.	Exhibitor	Contents
13	Hitachi, Ltd.	As welcoming the IoT era, we deliver innovations to society and customers by leveraging three strengths — operational technology(OT), IT and products/systems. We will introduce the lake purification technology and the sewage nitrogen treatment technology etc.
14	NISHIHARA Environment Co., Ltd.	<p>■ ROTARY FIN COLLECTOR (RFC) RFC is improved the operation manageability and concentration performance of gravity thickening tanks.</p> <p>■ ACTIFLO ACTIFLO is designed to dramatically enhance the processing efficiency compared with conventional coagulation sedimentation processing.</p>
15	Maezawa Industries, Inc	The MIEX® Technology has high performance to remove DOC (Dissolved Organic Carbon) from raw water. It shows the effect to reduce DBPs (Disinfection By-Products, e.g. precursor of Trihalo-methane, and Halo-acetic acid) . So it can use to install in a drinking water treatment plant taking DOC rich raw water from closed waters.
16	KANSEI	It is our mission to create a way for the used water to go back clean inside the water cycle to protect lakes and rivers and to pass on a beautiful environment to the next generation. For this, we, at KANSEI, propose "Pipe drainage maintenance system" using the latest equipment.
17	WEF Institute of Technology Inc	<p>α-Gaia: Generates active oxygen which is used to decompose organic material such as raw garbage, excess sludge, aquatic plants, food residue, etc.</p> <p>CLIRAC Coagulation Treatment: Rapidly coagulates and detoxifies harmful sludge containing substances like heavy metals, chemicals, oil etc. and also treats oil-based sludge.</p>
18	Hiyoshi Corporation	<ul style="list-style-type: none"> • Development of a management method for the invasive water primrose (Ludwigia grandiflora) in Lake Biwa • Our effort to SDGs • Our effort to BIWAKO-model
19	Sannyu.co.Ltd,	This technology is a technique of physically treating wastewater from a kitchen, residue is collected by a scum save net installed in a grease trap, oil separated and separated oil is adsorbed and collected on an oil adsorbent and recovered by a grease trap Improve performance.
20	Ubekogyo Co. ,Ltd.	We display Multifunctional small dredger ship (UD-1), Apparatus for dissolved Oxygen(AQUA RECOVERY), Multi-drain vacuum dehydration method (AQUA SOIL FILTER), Ground installed Sea wall, type of flap gate(neo RiSe).
21	Alpha Service Co., Ltd.	The eliminate system for Blue-green algae which degrade the water regime of the pond, the swamp or the lake. Mainly the solution which is settling by breaking flapper of them by water pressure, and the surfacing them by utilize the microbubble are shown with brochure, panel board and the video.
22 • 23	Nodak Co.Ltd. / P.T. ULTRATREX INDONESIA	<p>Introduction of an aquatic weed harvester and a multi-purpose machine to support management of aquatic environments.</p> <p>They are designed for removal of aquatic weeds abnormally propagated in dam lakes, natural lakes, rivers, retention basins, farm ponds/canals all over the world, which can also be used for removing floating garbage and drifting woods on water.</p>

Booth No.	Exhibitor	Contents
24	ANZAIKANTETSU, Co, Ltd	<p>We introduce our world most efficient and scalable Nanobubble system for purification and cleaning of sea, river, canal, lake and pond. Our Nanobubble solution is only one in the world that is capable for large scale deployment.</p> <p>We exhibit satisfying case example with accumulated data and know-how.</p>
25	World Chemical Co.,Ltd.	<p>We will display the actual operating unit and related products of floating pump, which is called "GYRO SKIMMER" to collect efficiency the "Algae", floating on a lake and a pond.</p> <p>We will also introduce the case study by using a catalogue, panel and the actual movie.</p>
26	FUJI CLEAN Co., Ltd.	<p>First in the world, we have developed the Jokaso CRX series. It removes the nitrogen and phosphorus which causes eutrophication in a closed water area, and has been used successfully in Japan. We'll exhibit and introduce the CRXII evolved from previous series by cut model.</p>
27	Ibaraki-ken Water Quality Conservation Society	<p>I will introduce about Johkasou which is the one of the method for protect water environment, in the panel, theme of "Lets return clean water for natural environment using Johkasou"</p>
28	Housetec Inc.	<p>We would like to introduce the decentralized wastewater treatment facility for household wastewater using a "cut sample". The introduced product (KTG-5) is for detached houses (5 residents), and has acquired the Japanese certificate with an effluent quality of BOD 15mg/L and T-N 20mg/L.</p>
29	Daio Densetsu Industrial Co., Ltd.	<p>Bio-toilet system (all patented), including Bio toilet, Bacteria, Separate toilet, Secondary separation system and Weight sensor system, will be introduced by using catalogs and videos at our booth. Thanks!</p>
30	Kyowa Kako Co., Ltd.	<p>Kyowa Kako Co. Ltd. started with Design・Construction・Operation of several wastewater treatment plants, and then Composting Plants all around Japan using biomass of sewage sludge, organic waste, etc. In this Congress, the company activities will be presented on catalogs and panels.</p>
31	OYO Corporation	<p>We will exhibit an alien fishes control method utilizing electrofishing boat and environmental DNA.</p> <p>We will also display the electrofishing boat, and the movie of capturing largemouth bass and channel catfish.</p>
32	Saitama-ken Environmental Analysis and Research Association	<p>We exhibit PR (public relations) materials of Japanese ETV (Environmental Technology Verification) program. The ETV program is a program to test usable "advanced environmental technologies" for evaluation purposes. Technological effects are "verified" in the form of objective data.</p>
33	JX Nippon Environmental Services Co., Ltd.	<ul style="list-style-type: none"> • Our contents introduced by a DVD and PowerPoint about our metallic recycling business. • Strengths <ul style="list-style-type: none"> ✓ We promote to sell a by-product (slag) to use for caisson instead of a river sand. ✓ About contribution to the reduction of the landfill dump.
34	Ciel Terre Japan Co.,Ltd	<p>As the pioneer company of the PV (Solar) system on the water, we explain the profit of solar power plant and propose local contribution. Projection of movie or presentation by our company staff.</p>
35	KASUMI Co., Ltd.	<p>Kasumi food supermarkets are working with consumers to achieve a sustainable society through such environmental corporate social responsibility (CSR) activities as Lake Kasumigaura conservation projects, recycling, tree planting, and environmental and dietary education. Here we present an introduction to these activities through panels, videos, pamphlets, and other media.</p>

Booth No.	Exhibitor	Contents
36	Ibaraki Co-op	We introduce our ecological activities with presentation panels and DVDs. - Recycling activities in our home delivery / store business - "Gakko of CO-OP"; we host the event which is a place of learning with family regarding environmental protection and ecosystems such as lakes and marshs, rivers and forests.
37	SEIBUTSUGIKEN Co., Ltd.	We provide environmental DNA analysis. We will introduce you on metabarcoding analysis using the next generation sequencer corresponding to various organisms other than fish and demonstrate water filtration equipment.
38	HORIBA Advanced Techno,Co.,Ltd.	HORIBA Advanced Techno is covering tasks such as environmental measurement.
39	BL TEC K.K.	We introduce continuous flow analyzer (CFA) listed in Ministry of the Environment notice law and JIS K 0102. And it is an analytical system that automates a series of work including pretreatment such as total nitrogen · total linen · fluorine · cyan · phenol contained in wastewater and environmental water.
40	Environmental system Inc.	Automatic profiler"MicroProfiler" is measures water quality vertically per 10cm each. "next-generation water quality measurement technique"
41	IDEA Consultants, Inc.	We exhibit work achievement and research development outcome on "Countermeasures and technologies for sustainable Ecosystem services," "Technologies for visualizing Underwater," "Current in lake/Water qualities Prediction System" and "Hydrologic cycle models of basin" on panels and pictures.
42	PACIFIC CONSULTANTS Co., Ltd.	We will introduce the water environment technology (modeling, monitoring, future prediction, etc.) and practice of efforts in the region (regional collaboration, etc.) that we have been working on through exhibits and pamphlets.

(3) Panel Exhibition by Sponsored Companies and Groups

Date & Time October 15 (Mon.)-October 19 (Fri.) 9:00-17:00

*By 13:00 on October 19.

Venue Aisle on 2F, Tsukuba International Congress Center

Outline Introduction of activities by sponsored and funded groups.

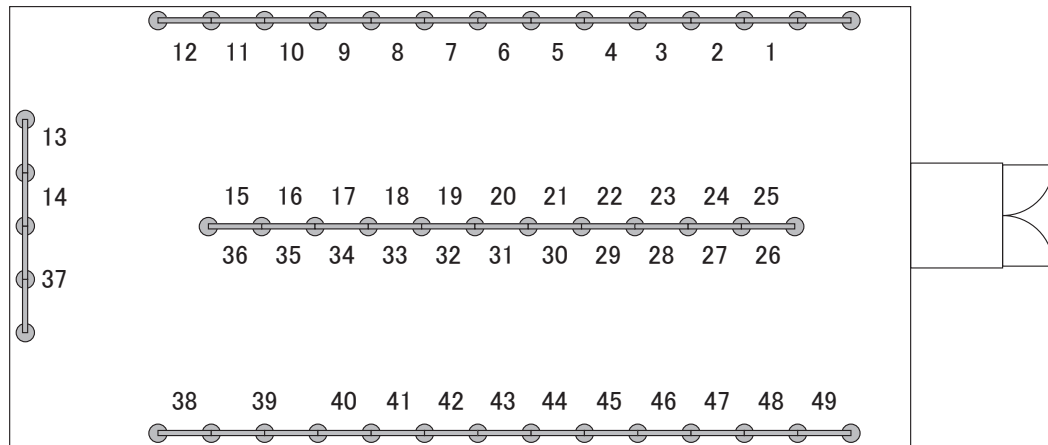
Exhibitors' List (in order of amount of support money and alphabet)

(As of September 21)

No.	Exhibitor	No.	Exhibitor
1	Hitachi, Ltd.	7	KASUMI Co., Ltd.
2	The Joyo Bank, Ltd	8	JFE Engineering Corporation
3	IBARAKI Prefecture development public corporation	9	SEKISHO CORPORATION
4	Honda Memorial Foundation	10	Sompo Japan Nipponkoa Insurance Inc.
5	JA Group Ibaraki	11	Tsukuba Bank, Limited
6	Water Agency		

(4) Exhibitions of Activities by Hosts

Date & Time	October 15 (Mon.)	8:00-17:00
	October 16 (Tue.), 18 (Thur.)	9:00-17:00 *Core time 11:00-14:00
	October 19 (Fri.)	9:00-13:00
Venue	Conference room 202B, Tsukuba International Congress Center	
Outline	Introduction of integrated activities on Lake Kasumigaura and so on by Hosts (Ibaraki Prefecture, The International Lake Environment Committee Foundation (ILEC)) and Co-hosts (Nation, city and town)	



1 ~ 25 Ibaraki Prefectural Organization 27 ~ 33 University, National Institution
 34 ~ 36 Research Result on Radiation in Ibaraki 26, 37 ~ 49 Hosts, Co-hosts

No.	Organization	Contents
1	Ibaraki Kasumigaura Environmental Science Center, Ibaraki prefectural Government	CONCEPT OF IBARAKI KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER
2		ENVIRONMENTAL EDUCATION PROJECT ETC. AT KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER
3		ON THE RESEARCH STUDY ON KASUMIGAURA AT THE KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER
4		ECOSYSTEM SERVICES OF LAKE KASUMIGAURA
5	Ibaraki Nature Museum	CONSERVATION ACTIVITY OF ENDANGERED PLANTS AT SUGAO-MARSH, IBARAKI PREFECTURE, JAPAN
6	Ramsar Convention Register Wetland Hinuma Association	ABOUT THE RAMSAR CONVENTION REGISTRATION WETLAND "HINUMA"
7	Biodiversity Center, Natural Environment Division, Ibaraki Prefectural Government	EFFORTS OF THE BIODIVERSITY CENTER BY IBARAKI PREFECTURAL GOVERNMENT
8		RICH BIODIVERSITY OF LAKE KASUMIGAURA AND ITS SURROUNDING AREAS
9	Ibaraki Prefectural Livestock Research Center	"A LOW-PROTEIN DIET SUPPLEMENTED WITH SYNTHETIC AMINO ACIDS"MAKES ANIMAL INDUSTRY ENVIRONMENT-FRIENDLY
10	Livestock division, Ibaraki prefectural Government	LIVESTOCK AND EFFORTS TO IMPROVE WATER QUALITY IN KASUMIGAURA WATERSHED
11	Ibaraki agricultural center, Ibaraki prefectural Government	EFFORTS TO REDUCE ENVIRONMENTAL IMPACT IN LAKE KASUMIGAURA BY THE IBARAKI AGRICULTURAL CENTER
12	Agricultural Technology Division, Ibaraki Prefectural Government	EFFORTS TO REDUCE ENVIRONMENTAL BURDEN IN AGURICULTUE IN KASUMIGAURA BASIN
13	Public Enterprise Bureau, Ibaraki prefectural Government	ABOUT NEW ADVANCED WATER TREATMENT TECHNOLOGY

No.	Organization	Contents
14	Regional Sewerage Office, Ibaraki prefectural Government	ADVANCED WASTEWATER TREATMENT OF KASUMIGAURA SEWAGE TREATMENT CENTER
15	Industrial Technology Innovation Center, Ibaraki Prefectural Government	HIGH EFFICIENCY ON-SITE MEASUREMENT SYSTEM FOR HEAVY METALS VIA COMBINATION OF HOMOGENEOUS LIQUID-LIQUID EXTRACTION (HOLLE) AND SMART DEVICE
16	Kasumigaura and Kitaura Fishery Office, Ibaraki Prefectural Government	MARINE PRODUCT PROCESSING IN LAKE KASUMIGAURA, LAKE KITaura AND OTHER LAKES
17	Kasumigaura and Kitaura Fishery Office, Ibaraki Prefectural Government	MEASURES FOR THE CONSERVATION OF MARINE RESOURCES AND FISHING GROUND IMPROVEMENT IN LAKE KASUMIGAURA AND LAKE KITaura
18	Culture Division, Prefectural Education Agency, Ibaraki Prefectural Government	THE SAILBOAT AND SAILBOAT NET FISHING OF KASUMIGAURA
19	Regional Development division, Ibaraki prefectural Government	INTRODUCTION OF TSUKUBA-KASUMIGAURA RING-RING ROAD
20	Tourism and Local Products Promotion Division, Ibaraki prefectural Government	IBARAKI TOURISM
21	Environmental management division, Ibaraki prefectural Government	WATER QUALITY IN LAKE KASUMIGAURA
22		7 TH PLAN FOR CONSERVATION OF LAKE WATER QUALITY
23		FOREST LAKE ENVIRONMENT TAX WORK
24		EFFORTS TO IMPROVE WATER QUALITY IN LAKE HINUMA BY THE IBARAKI PREFECTURAL GOVERNMENT
25		WATER QUALITY AND WATER QUALITY CONSERVATION MEASURES OF LAKE USHIKUNUMA
26	The Council for conservation of Lake Kasumigaura	EFFORTS FOR PURIFICATION OF WATER QUARITY IN LAKE KASUMIGAURA BY THE COUNCIL FOR CONSERVATION OF LAKE KASUMIGAURA
27	National Agriculture and Food Research Organization (NARO)	RESEARCH AND DEVELOPMENT FOR SUSTAINABLE AGRICULTURAL PRODUCTION - CONSERVATION OF WATERSHED ENVIRONMENT AND ECOSYSTEM SERVICES
28	National Institute for Environmental Studies	LONG-TERM MONITORING OF LAKE KASUMIGAURA, JAPAN – A 42 YEAR LEGACY AND LOOKING TO THE FUTURE –
29	Lake Biwa Branch Office , National Institute for Environmental Studies	TOWARDS CONSERVATION AND RESTORATION OF LAKE BIWA'S WATER ENVIRONMENT AND ECOSYSTEM: FOUNDATION AND PROSPECTS OF LAKE BIWA BRANCH OFFICE
30	River Restoration Team, Water Environment Research Group, Public Works Research Institute (PWRI)	RESEARCH OVERVIEWS OF TECHNIQUES OF WATER ENVIRONMENTAL MANAGEMENT CONSIDERING BIODIVERSITY AND WATER QUALITY -APPROACHES TO CONSERVATION PLANNING FOR COMPATIBILITY BETWEEN CONSERVATION OF IMPORTANT SPECIES OF AQUATIC VEGETATION AND CONTROL OF INVASIVE SPECIES
31		DEVELOPMENT OF WATER ENVIRONMENT MANAGEMENT AND CONTROL TECHNIQUES FOR BIODIVERSITY AND WATER QUALITY IN LAKES - ASSESSMENT AND MONITORING METHODS FOR CONSERVATION IN BASIN WATER ENVIRONMENT -
32	Faculty of Life and Environmental Sciences, Research Unit on Hydrologic Science, University of Tsukuba	HYDROLOGIC CYCLE AND WATER BALANCE OF LAKE KASUMIGAURA
33	Ibaraki University	IBARAKI UNIVERSITY - EDUCATIONAL AND RESEARCH ACTIVITIES RELATED TO THE WATER ENVIRONMENT

No.	Organization	Contents
34	Environmental management division, Ibaraki prefectural Government	RADIOACTIVE MATERIAL MONITORING SURVEYS OF THE WATER ENVIRONMENT IN THE KASUMIGAURA WATERSHED
35	Agricultural Technology Division, Ibaraki Prefectural Government	RESULTS OF RADIOACTIVE MATERIALS (Cs-134 AND Cs-137) TESTING OF AGRICULTURAL, FORESTRY AND FISHERY PRODUCTS IN IBARAKI
36	Environmental Radiation Monitoring Center, Ibaraki Prefectural Government	FOR ENVIRONMENTAL RADIATION MONITORING IN IBARAKI PREFECTURE
37	The International Lake Environment Committee Foundation (ILEC)	SAVE WATER, SAVE LAKES OF THE WORLD: PROMOTING SUSTAINABLE MANAGEMENT OF LAKES AND THEIR BASINS
38	Ministry of Land Infrastructure, Transport and Tourism	ENVIRONMENTAL CONSERVATION EFFORTS IN LAKES BY THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM
39	Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transportation and Tourism	WATER ENVIRONMENTAL IMPROVEMENT IN LAKE KASUMIGAURA
40	Kasumigaura Conveyance Works Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transportation and Tourism	KASUMIGAURA WATER CONVEYANCE PROJECT
41	Tone River Downstream Integrated Operation and Maintenance Office Water Agency	EFFORTS IN THE KASUMIGAURA DEVELOPMENT PROJECT (MANAGEMENT)
42	Water Environmental division, Environment Management Bureau, Ministry of the Environment	'BOTTOM-LAYER DISSOLVED-OXYGEN' AND 'SHORE TRANSPARENCY': NEW INDICATORS FOR JAPAN LAKES AND RESERVOIRS - TO REALIZE BETTER ENVIRONMENTAL WATER-QUALITY AND INTRODUCE INDICATORS THAT THE PUBLIC CAN READILY UNDERSTAND -
43	Environment policy office, Policy planning division, Ministry of Agriculture, Forestry and Fisheries	EFFORTS TO CONSERVE BIODIVERSITY IN AGRICULTURE, FORESTRY AND FISHERIES
44	Environmental Conservation Division, Tsuchiura City	EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA BY TSUCHIURA CITY
45	Environmental Conservation division, Tsukuba City	EFFORTS TO IMPROVE WATER QUALITY BY THE TSUKUBA CITY
46	Life Environmental Section, Kasumigaura City	EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA BY KASUMIGAURA CITY
47	Life Environmental Section, Hokota City	~ PARADISE FOR PEOPLE AND WILDLIFE ~ EXPANDING THE POWER OF NATURE IN NORTH KITAURA
48	Green Environmental Section, Ibaraki Town	ENVIRONMENTAL CONSERVATION AND WISE USE AT HINUMA, IBARAKI TOWN
49	Environment Section, Mito City	MITO CITY ENVIRONMENTAL FAIR 2018

(5) Recycling Glass Art Exhibition

Room Foyer of Convention Hall 300, Tsukuba International Congress Center

6 Information for Participants

(1) Registration Categories and Fee

There are two ways to register for participation, "Full Conference" and "One-day".

		Full Conference (Fees in parentheses apply to developing countries)			One-day (Fees in parentheses apply to developing countries)	
		Early Registration	Regular Registration	On-site Registration	Advance Registration	On-site Registration
Period		Feb 5~ July 16, 2018	July 17~ Sep 14, 2018	Oct 14~ 19, 2018	Feb 5~ Sep 14, 2018	Oct 14~ 19, 2018
Category	Regular	16,000 (12,000)	18,000 (12,000)	20,000 (14,000)	4,500 (3,000)	5,000 (3,500)
	Student (college students) (graduate students)	10,000 (8,000)		12,000 (10,000)	2,500 (2,000)	3,000 (2,500)
	Accompanying person (relative only)	4,000			1,000	

(All fees are in Japanese yen)

《Notice》

- High school students and younger will be charge-free for registration when they submit or show documents such as student ID or official documents from your institution.
- Developing countries rate will be applied to participants from developing countries in line with OECD standards (DAC List of ODA Recipients). If you choose to register with this rate, please submit your passport copy. You can find a more detailed instruction in your My Page and in the registration confirmation email.
- Accompanying persons (relatives of regular participants only) may register for social events and excursions individually.

(2) Registration Date, Time and Place

Date	Registration	Place
October 14, (Sun.)	9:00-	Tsukuba International Congress Center 1F Entrance Hall
October 15, (Mon.)	8:00- *	
October 16, (Tue.)	8:00-	
October 17, (Wed.)	8:00- Excursion 7:00-	
October 18, (Thur.)	8:00-	
October 19, (Fri.)	9:00-	

* October 15, Monday <Opening Ceremony >

- Due to security reasons, entry and exit from the Main Hall will be prohibited during the Opening Ceremony and the Ibaraki Kasumigaura Award Ceremony.

《Notice》

- Those who do not have an ID card will be prohibited to enter the venue. Please wear your ID card when you visit the venue during the conference period.
- Registration Fee includes the following:
 - Participation in conference program (Full conference registrant: October 15 (Mon.) to 19 (Fri.), One-day: one of the days between October 15 (Mon.) to 19 (Fri.))
 - Congress Kit (Program & Abstract book, pamphlets on Ibaraki Prefecture and Co-hosts, etc.)

(3) Cloak

Date	Time	Place
October 14 (Sun.)	9:00-17:00	Entrance Hall, 1F, Tsukuba International Congress Center
October 15 (Mon.)	9:00-17:00	
October 16 (Tue.)	8:00-20:00	
October 18 (Thur.)	8:00-20:00	
October 19 (Fri.)	9:00-14:00	

*Please bear in mind that we cannot keep any valuables, umbrellas, and laptops.

(4) Pray Room

Date	Time	Place
October 14 (Sun.)	9:00-17:00	For men: 101 For women: 201 Tsukuba International Congress Center
October 15 (Mon.)	13:30-18:00	
October 16 (Tue.)	9:00-20:00	
October 17 (Wed.)	9:00-20:00	
October 18 (Thur.)	9:00-20:00	
October 19 (Fri.)	9:00-13:00	

(5) Coffee Corner

Date	Time	Place
October 15 (Mon.)	Afternoon	Lobby in front of Main Convention Hall
October 16 (Tue.)	Morning/Afternoon	Lobby in front of Main Convention Hall, on 2F & 3F
October 18 (Thur.)	Morning/Afternoon	
October 19 (Fri.)	Morning	Lobby in front of Main Convention Hall

(6) Information on nearby restaurants

For information on restaurants around the venue, please see website: <http://www.tsukucen.net/about/gourmetmap/>

*Website is written in Japanese, but English ver. of each map (restaurant and shop guide) is available under the Japanese ver.

Please note “Restaurant ESPOIR” located in the venue is closed on October 15 (Mon.)

(7) Program for participants

An entertaining program of activities will be prepared for domestic and international participants. Please be sure to check it out!

Dates and Time	Contents	Place
October 16 (Tue.) 9:00-17:00	Photo Booth	Entrance Hall, Tsukuba International Congress Center
October 18 (Thur.) 9:00-15:00	To experience the comfort of wearing “Yuki-Tsumugi”, the Japanese craft of silk cloth which has been inscribed on the UNESCO List of Intangible Cultural Heritage.	

(8) Social Events

◆ Welcome Party

Date & Time October 14 (Sun.), 2018 18:00-20:00

Venue “Shinonome”, Hotel Grand Shinonome (488-1 Onozaki, Tsukuba City, Ibaraki Prefecture, 305-0034)

Outline Prior to the conference, a welcome party will be held. Meals and drinks will be served. Please feel free to attend the party to socialize with other participants.

◆ Participant Get-Together

Date & Time October 18 (Thu.), 2018 18:00-20:00

Venue Conference Rooms 101, 102, Tsukuba International Congress Center

Outline The night before the last day of the conference, networking event for participants will be held. Light meals (snacks) and drinks will be served. The award ceremony of best presentation award is also held. It will be the last social event during the conference to exchange views beyond culture and background, while reflecting on the conference.

◆ Reception

Reception held on October 15 (Mon.) is only for invitees. For invitees, please bring your invitation letter to the venue.

(9) Other information

(i) Information for people with disabilities, etc.

If you have a disability, use a wheelchair or are pregnant, please contact the Secretariat in advance. We will make arrangements for a parking lot near the venue.

Contact number before the conference: +81-3-3263-8695

Contact number during the conference: +81-29-861-0601

(ii) If you feel unwell, please advise a nearby member of staff.

(10) Excursions

◆ Kasumigaura Course

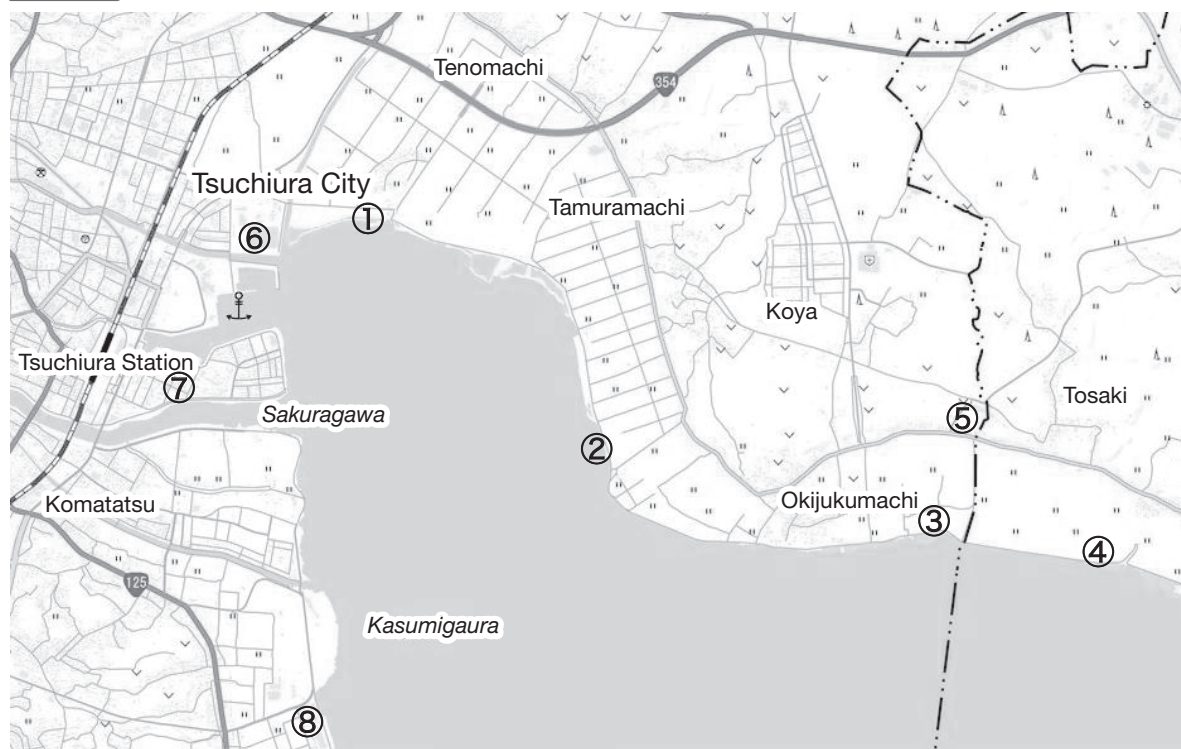
Date & Time October 17 (Wed), 2018 8:40-16:50

Outline Visit national and prefectural environmental facilities around Lake Kasumigaura. Experience the ecosystem services of Lake Kasumigaura and learn about initiatives for its water purification.

Itinerary (Departure times, arrival times and the excursion order may change depending on the excursion group.)





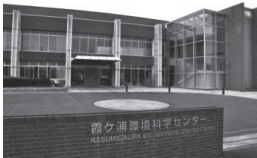

Time	Time at site	Course (Refer to numbers on site map)	Location
8:40	—	(Depart)	Tsukuba International Congress Center
9:05-9:25	20 min	① Site visit	Ishida Lakeshore
9:35-10:10	35 min	② Site visit	Nature Restoration Project (Section B)
10:20-11:00	40 min	③ Site visit	Nature Restoration Project (Section H)
11:00-11:05	5 min	④ Site visit	Kawajirigawa Wetland
11:10-13:00	110 min	⑤ Presentation, lunch	Ibaraki Kasumigaura Environmental Science Center
13:20-14:10	50 min	⑥ Site visit	Ibaraki Prefectural Lake Basin Sewerage Office
14:20-15:10	50 min	⑦ Site visit	Lake Kasumigaura Direct Purification Test Facility
15:25-16:15	50 min	⑧ Site visit	Ibaraki Prefectural Kasumigaura Water Purification Plant
16:50		(Arrival)	Tsukuba International Congress Center



Site Map



(This map is based on the Digital Map (Basic Geospatial Information) published by Geospatial Information Authority of Japan.)

Outline of sites visited

Site visited	Outline
	<p>① Ishida Lakeshore [Tenomachi, Tsuchiura City]</p> <p>The Ishida lakeshore is a location scheduled to showcase the future vision for Lake Kasumigaura. Using a direct purification facility to purify the lake water and discharge it into a closed zone within the lake will provide visibility to the purification effects and encourage residents to feel an affinity for Lake Kasumigaura.</p>
	<p>② Nature Restoration Project Area (Section B) [Tamuramachi, Tsuchiura City]</p> <p>With a goal of restoring the habitats of various organisms, improvements have been made to the lakeshore environment of embayments and other areas with shallow water, flat water and deep water. This area has been used as a place for environmental studies, such as hands-on boating courses.</p>
	<p>③ Nature Restoration Project Area (Section H) [Okijukumachi, Tsuchiura City]</p> <p>With a goal of preserving existing vegetation and restoring waterside spaces which have continuity with lakes, improvements have been made to jetties, submerged breakwaters, littoral nourishment and so on. This area has been used as a place for environmental studies, such as aquatic life survey.</p> <p>The Nature Restoration Committee was established in 2004 pursuant to the Law for the Promotion of Nature Restoration. It promotes projects with an aim of preserving and restoring the diverse natural environment that once existed along the lakeside, and utilizing them as a place for environmental learning in cooperation with the Ibaraki Kasumigaura Environmental Science Center.</p> <p>* Law for the Promotion of Nature Restoration: Enacted in December 2002 (MLIT, MOE, MAFF)</p> <p>* The Committee is comprised of a total of 39 members (March 2018), including specialists, members recruited and commissioned from the public, and government officials</p>
	<p>④ Kawajirigawa Wetland [Tozaki, Kasumigaura City]</p> <p>At the mouth of this inflowing river, a small lake (inner lake) separated by an embankment has been established, with an aim of reducing the burden caused by the retention and sedimentation of inflowing contaminants and creating a biological habitat and purification function provided by lakeshore vegetation zones.</p>
<p>▶ Presentation ▶ Lunch</p> 	<p>⑤ Ibaraki Kasumigaura Environmental Science Center [Okijukumachi, Tsuchiura City]</p> <p>The aim of this comprehensive facility is to tackle conservation of the water environment and air environment of lakes and rivers, including Lake Kasumigaura. It has four distinct functions: research and technical development; environmental education; cooperation and support for citizen's activities; and information and exchange.</p> <p>[Presenting organizations]</p> <ul style="list-style-type: none"> • Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) • Ibaraki Nature Museum • Ibaraki Prefectural Kasumigaura Water Purification Plant, Ibaraki Prefectural Lake Basin Sewerage Office <p>Environmental Management Division, Department of Civil Affairs and the Environment, Ibaraki Prefecture Ibaraki Kasumigaura Environmental Science Center</p>
	<p>⑥ Ibaraki Prefectural Lake Basin Sewerage Office [Kohoku, Tsuchiura City]</p> <p>This office promotes projects based on the key policies of restoration and creating a society in which people can live with peace of mind. As a countermeasure for domestic wastewater, it is purified at a sewage plant and discharged into Lake Kasumigaura and into the sea and rivers.</p>

Site visited	Outline
	<p>⑦ Lake Kasumigaura Direct Purification Test Facility [Kawaguchi, Tsuchiura City]</p> <p>Demonstration testing to control outbreaks of phytoplankton and to improve water quality are being conducted, by pumping up lake water in Tsuchiura Port and reducing phosphorus and other elements that are a factor in the proliferation of algal blooms and other phytoplankton.</p>
	<p>⑧ Ibaraki Prefectural Kasumigaura Water Purification Plant [Oiwa, Tsuchiura City]</p> <p>This is a water purification plant that sources water from Lake Kasumigaura. It supplies tap water to places including Tsukuba City and Tsuchiura City. In order to provide a stable supply of safer and more secure tap water, efforts are underway to introduce new advanced water treatment technologies.</p>

◆ Lakes Kitaura, Hinuma and Senba Course

Date & Time October 17 (Wed.), 2018 8:00-17:20

Outline Visit the lakes of Kitaura, Hinuma and Senba, and be introduced to the initiatives of relevant organizations related to Lake Hinuma—a wetland site registered under the Ramsar Convention.

Itinerary

Time	Time at site	Course (Refer to no. on site map)	Location
8:00	—	(Depart)	Tsukuba International Congress Center
9:10-9:30	20 min	① Site visit	Northern Kitaura Area
10:15-12:45	150 min	② Presentation, lunch	Ikoimura Hinuma
13:15-13:35	20 min	③ Site visit	Hinuma Nature Park
14:35-15:15	40 min	④ Site visit	Naka Pumping Station (Kasumigaura Water Conveyance Project)
15:35-16:10	35 min	⑤ Site visit	Lake Senba
17:20	—	(Arrival)	Tsukuba International Congress Center

Site Map



(This map is based on the Digital Map (Basic Geospatial Information) published by Geospatial Information Authority of Japan.)

Outline of sites visited

Site visited	Outline
	<p>① Northern Kitauro Area [Yasuzuka, Hokota City]</p> <p>The Northern Kitauro Area retains an untouched natural environment that could be described as archetypal Japanese landscape. Especially in the basin wetlands of the Hokota River and Tomoe River, which are adjacent to the old town, you can see a rich natural environment, including diverse organisms and aquatic flora.</p>
<p>► Presentation ► Lunch</p> 	<p>② Ikoimura Hinuma [Minowa, Hokota City]</p> <p>This onsen (hot spring) resort fronts Lake Hinuma, the only brackish lake in the Kanto region. Located on the resort premises, the Information Plaza showcases the nature and other aspects of Lake Hinuma—a designated Ramsar site—in an exhibition titled “Feel the Nature, History and Culture of Lake Hinuma.”</p> <p>[Presenting organizations]</p> <ul style="list-style-type: none"> • Ohinuma Fisheries Cooperative • The Promotion Committee of Hinuma Ramsar Site • The Association of Lake Hinuma, Registered Ramsar Site
	<p>③ Hinuma Nature Park [Nakaishizaki, Ibaraki Town, Higashiibaraki District]</p> <p>Located close to Lake Hinuma, this park takes advantage of the natural topography. Walking trails and streams flow through the park, where you can enjoy seasonal flowers and birdlife, and the Taiyo no Hiroba located on a high point of the park provides a sweeping view of Lake Hinuma.</p>
	<p>④ Naka Pumping Station (Kasumigaura Water Conveyance Project) [Wataricho, Mito City]</p> <p>The Naka Pumping Station is part of the Kasumigaura Water Conveyance Project, the aims of which include maintaining the normal functions of water purification and flow. From pumps installed in the pumping station, water from the Naka River is conveyed through underground tunnels to Lake Kasumigaura and Sakura River. Water from Lake Kasumigaura to Naka River is also conveyed through this facility.</p>
	<p>⑤ Lake Senba [Senbacho, Mito City]</p> <p>Located roughly in the center of Mito City, Lake Senba is both a relaxing place for residents and a welcoming place for tourists. Kairakuen (considered one of the Three Great Gardens of Japan) offers a particularly spectacular view over the lake.</p>

(11) Workshop

Workshops will be held by conference participants as follow. If you already registered, please directly come to the room. On-site is also available.

Please note the participants are required to register for main conference as well.

Workshop 1

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 201A, Tsukuba International Congress Center

Theme The current state of brackish water lakes in the coastal region of the Japan Sea and the restoration of their ecosystem functions

Purpose There are many brackish lakes in the coastal region of the Japan Sea. We will introduce the current condition of several representative brackish lakes, specifically Lake Shinjiko and Lake Nakaumi, Lake Koyamaike, Lake Hachirogata, Lake Kahokugata, and discuss how to restore the original ecosystem functions to these bodies of water.

Organization Kahokugata Lake Institute

Workshop 2

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 201B, Tsukuba International Congress Center

Theme Initiatives by local authorities toward making lake environments habitable for shijimi clams

Purpose Discuss the necessary initiatives for collaborating local authorities to improve the water environment of lakes and reservoirs, as well as the ways administrations can further their efforts, based on the characteristics of lakes and the issues they face and sharing initiatives taken in various regions.

Organization Department of Lake Biwa and the Environment, Lake Biwa Policy Division, Shiga Prefectural Government

Workshop 3

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 202A, Tsukuba International Congress Center

Theme Thinking eutrophication with the nitrogen footprint for our dietary life

Purpose Too much reactive nitrogen in the environment can induce severe environmental issues such as eutrophication, global warming, biodiversity reduction, etc. The objectives of this workshop are to understand a new concept "Nitrogen Footprint" and to freely exchange opinions, for example, on the close relationship between the consumers' dietary life style and environmental load of reactive nitrogen and on the effects of improving our dietary life on reducing reactive nitrogen load to the environment.

Organization College of Agriculture, Ibaraki University

Workshop 4

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 303, Tsukuba International Congress Center

Theme Information platform, Integrated Lake Basin Management (ILBM) , Sustainable Development Goals (SDGs)

Purpose

- Understanding the complexity of managing lake environment in Asia and the role of information platform.
- Discuss effective approaches for establishing information platform for the integrated management of the lake and its basins based on the experiences of the lake Biwa, Japan, the lake Laguna, the Philippines, and the Tonle Sap lake, Cambodia.
- Improving participation of stakeholders in the establishment, use, and management of lake information platform.

Organization Institute for Global Environmental Strategies (IGES)

Workshop 5

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 304, Tsukuba International Congress Center

Theme Issues and management challenges of lake basin management of South Asia

Purpose To deliberate and share experience on the issues and challenges of lake basin management in South Asia

Organization Wetlands International South Asia

Workshop 6

Date & Time October 16 (Tue.), 2018 18:00-20:00

Room Conference room 404, Tsukuba International Congress Center

Theme Let's share the information and ideas on citizen activities for waterfront environment and societies.

Purpose Sharing Information and ideas on Citizen Activities for the Waterfront Environment and Societies

Organization Kasumigaura Academy

Workshop 7

Date & Time October 16 (Tue.), 2018 18:00-20:00

October 17 (Wed.), 2018 18:00-20:00

Room Conference room 406, Tsukuba International Congress Center

Theme People living in Nishiura / Kitaura <Millennium Village>
—Historical analysis of sustainable waterside living—

Purpose The Lake Kasumigaura water system is an area developed together with rice culture. Because the existing place name is published in the dictionary of the 10th century, there is also the name of "Millennium Village". By analyzing the living people's living on the waterside of Lake Kasumigaura in the case of "Millennium Village", we will consider the relationship between people and lakes in the future.

Organization Hitachinokuni waterside space forum

Workshop 8

Date & Time	October 17 (Wed.), 2018 18:00-20:00
Room	Conference room 201A, Tsukuba International Congress Center
Theme	Meeting of participants in Knowledge Co-Creation Program (ILBM etc.)
Purpose	Building a relationship between trainees getting the knowledge of ILBM, we will use it for the future lake management.
Organization	International Lake Environment Committee (ILEC)

Workshop 9

Date & Time	October 17 (Wed.), 2018 18:00-20:00
Room	Conference room 201B, Tsukuba International Congress Center
Theme	Successful Report on Water pollution control of African lakes and stop starvation by propagation of Ecosan toilets—Aiming at SDGs 2,6 and 14
Purpose	NICCO has been working with Lake Malawi and Lake Victoria areas for supporting village development, eliminating starvation by providing Ecosan toilets and clean water. Point source pollution was controlled and agricultural yields increased in the villages. NICCO's experiences can be easily propagated to other parts of the world. This workshop provides such experiences by African experts.
Organization	Nippon International Cooperation for Community Development (NICCO)

Workshop 10

Date & Time	October 17 (Wed.), 2018 18:00-20:00
Room	Conference room 202A, Tsukuba International Congress Center
Theme	Cooperation between Indonesia and Japan towards the policy development of sustainable lake management
Purpose	By sharing the current status, issues of management and the direction of countermeasures of the lakes both in Indonesia and Japan, we will contribute to the policy development of sustainable lake management in both countries in the future.
Organization	Water Environment Division, Environmental Management Bureau, Ministry of the Environment

7 Information for Presenters

(1) Information for Oral Presenters

① PC Center

Please check in your data at the PC Center located at the Entrance Hall, 1F, 30 minutes prior to the starting time of your section. Please bring your presentation data on a media (USB Flash memory or CD-ROM) or bring your own PC or Mac.

② Opening Hours:

Date	Time	Venue
October 15 (Mon.)	8:00	Tsukuba International Congress Center Entrance Hall, 1F
October 16 (Tue.)	8:00	
October 18 (Thur.)	8:00 (Last section starts at 15:40)	

③ For Presentation

- After data check-in, please enter the session room before the starting time of the section.
- Please be seated in the "Next Presenters' seats" located at the front left of your session room prior to your session.

④ Presentation Time

Program	Presentation ID	Allotted Time	Presentation ID (Invited presentation)	Allotted Time
Technical Session 1	O1-1 ~ O1-42	Presentation: 15min. Q&A: 5min.	TS1-1, TS1-2	Presentation: 30min. Q&A: 10min.
Technical Session 2	O2-1 ~ O2-12		TS2-1, TS2-2	
Technical Session 3	O3-1 ~ O3-42		TS3-1, TS3-2	
Technical Session 4	O4-1 ~ O4-12		TS4-1, TS4-2	
Technical Session 5	O5-1 ~ O5-27		TS5-1, TS5-2	
Technical Session 6	O6-1 ~ O6-28		TS6-1, TS6-2	
Technical Session 7	O7-1 ~ O7-28		TS7-1, TS7-2	
Technical Session 8	O8-1 ~ O8-28		TS8-1, TS8-2	
Technical Session 9	O9-1 ~ O9-26		TS9-1, TS9-2	

⑤ Specification of PC

The specification of prepared PC during conference is as follows:

- OS: Windows10
- Application Software: Windows PowerPoint 2016/2013.

⑥ Language in Presentation Slide

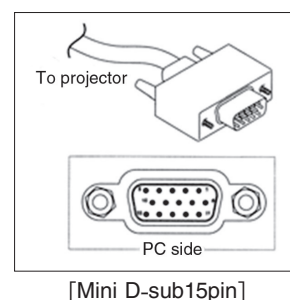
Both Japanese and English are acceptable in Power Point. The outline, keywords and figures should be English

< Windows >

- Please bring your presentation data on a media (USB Flash memory or CD-ROM). Please name your presentation data as "Presentation ID_Presenter's name".
- Font styles are limited as below:
MS Gothic / MSP Gothic / Times New Roman / Century
- Please be sure to use an aspect ratio of 4:3 for your presentation slides. The resolution of the LCD projector is XGA (1024 × 768). One side projection is available.
- For any audio or video playing, please refer to < Macintosh or Animation or Film Including Data > as below.
- Presenters may not use "presentation tool" included in PowerPoint.
- Presentation data will be copied to a PC in the section room. The Secretariat will be responsible for deleting all copies of any data after the conference.

< Macintosh or Animation or Film Including Data >

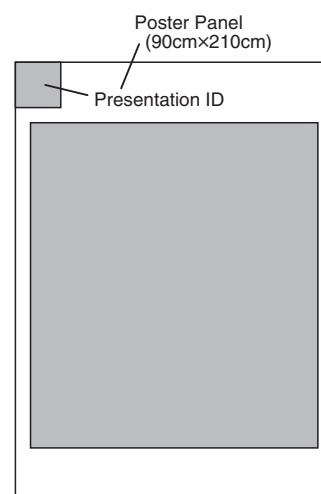
- Please bring your presentation data on a media (USB Flash memory or CD-ROM) or bring your own PC or Macintosh PC.
- The Secretariat will prepare a MiniDSub 15 pin PC cable connector (see the below image). If your machine is not compatible with this cable connector, please bring an adaptor to connect your machine to the MiniD-15 pin PC cable connector. Also, please bring your AC adaptor with you.
- If you have prepared your presentation data on a different PC from the one you have brought with you, please check beforehand that the images displayed on the LCR screen can actually be outputted externally. Sometimes the images cannot be outputted, therefore, we would like you to confirm in advance that the external output can be done successfully.
- For any audio or video playing, please kindly bring the data which could be used for movie files on Windows Media Player.
- Presenters may not use "presentation tool" included in PowerPoint.
- For any password setting, screensaver and power-saving setting, please release it beforehand.
- In order to avoid running out of battery during your presentation, please bring a power cable.
- Please bring your presentation data on a media (either on USB flash memory or CD-ROM) as a backup file.



(2) Information for Poster Presenters

① Poster Panel

- The size of the poster panel is W90cm × H210cm (see the image as below).
- Pushpins will be provided along with the board.
- Please place your poster in the designated area. As your poster is fitted in the panel, any size, format, and the number of sheets are available.
- Any quality of the poster material is available, but only pushpins are available for mounting.
- Presentation ID will be provided by Secretariat.



② The schedule of Set-up, Removal

- Set-up: October 15 (Mon.), 14:00 - 17:00 (Technical Sessions)
October 16 (Tue.), 8:00 - 9:00 (Technical Sessions)
October 18 (Thur.), 8:00 - 9:00 (Technical Sessions/Lake Kasumigaura Session)
*Please set up the poster by yourselves (presenters).
*Before set-up, please check-in at registration desk to receive name card and congress kit.
- Removal: October 18 (Thur.), after 15:00 (Technical Session)
*The posters will be removed by Secretariat.
October 18 (Thur.), 17:00-18:00 (Lake Kasumigaura Session)
*Please remove your poster by yourselves (presenters).

③ Presentation Date and Time

< Core Time >

Poster Number	Technical Sessions	Lake Kasumigaura Session
Odd number	October 16 (Tue.) 13:00-14:00	October 18 (Thur.) 12:00-13:00
Even number	October 18 (Thur.) 13:00-14:00	October 18 (Thur.) 13:00-14:00

< Browsing Time >

Technical Sessions	Lake Kasumigaura Session
October 16 (Tue.) 9:00-18:00	October 18 (Thur.) 9:00-17:00
October 18 (Thur.) 9:00-15:00	

⑤ Notes

The posters removed by Secretariat will be kept at the Information Desk until 14:00 on October 19 (Fri.). The organizers will dispose any posters that remain up after this time.

(3) Award of Proceedings

Ibaraki Kasumigaura Prize

Ibaraki Prefecture will award the Ibaraki Kasumigaura Prize (certificates of commendation and a supplementary prize) to up to 10 distinguished full papers submitted by participants from developing countries. This award aims to contribute to the research, technology development, and to the exchange of information on the lakes, rivers and related research fields. Please refer to the list on p.35 of this announcement.

Best Presentation Award

In order to motivate interest of participation, presentation, and research, best presentation will be awarded, which are presented in Technical Sessions. The presentation will be awarded in oral and poster presentation in each technical session. Please refer to p.20 of this announcement.

8 Program

○ Program in Conference

(1) Opening Ceremony	P.35
(2) Ibaraki Kasumigaura Prize Award Ceremony	P.35
(3) Keynote Speech	P.35
(4) Policy Forum	P.35
(5) Lakes Session	P.36
(6) Lake Kasumigaura Session	P.39
(7) Technical Sessions	P.44
(8) Conference Summary	P.86
(9) Closing Ceremony	P.86

○ Pre-Conference Program

(10) Student Conference	P.88
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8 Program

(1) Opening Ceremony

Date & Time October 15 (Mon.), 2018 10:30-11:30, Opening performance 10:15-10:30

Room Main Convention Hall, Tsukuba International Congress Center

Order of Ceremony

Opening performance		
Opening ceremony		
Greeting from hosts	Governor of Ibaraki Prefecture, Chair of Executive Committee	Kazuhiko Oigawa
	President, International Lake Environment Committee Foundation	Kazuhiko Takemoto
Greeting from Imperial family	His Imperial Highness Prince Akishino	
Congratulatory message	Ministry of Land, Infrastructure, Transport and Tourism	
	Ministry of the Environment	
	Ministry of Agriculture, Forestry and Fisheries	
	Director, United Nations Environment Programme	Keith Alverson
	Governor of Shiga Prefecture	Taizo Mikazuki
Introduction of speakers		
Welcome address	Chairperson of Ibaraki Prefectural Assembly	Tsuneo Yamaoka
Report on summary of ideas at Student Conference	Student conference representatives (students from elementary school, junior high school, and senior high school)	
Closing ceremony		

(2) Ibaraki Kasumigaura Prize Award Ceremony

Date & Time October 15 (Mon.), 2018 11:30-11:50

Room Main Convention Hall, Tsukuba International Congress Center

Outline Ibaraki Prefecture award the Ibaraki Kasumigaura Prize (certificates of commendation and a supplementary prize) to up to 10 excellent proceedings papers submitted by participants from the countries and regions.

(3) Keynote Speech

Date & Time October 15 (Mon.), 2018 13:10-14:10

Room Main Convention Hall, Tsukuba International Congress Center

Title Future of Lakes under Global Environmental Change

Speaker Nobuo Mimura (President, Ibaraki University)

(4) Policy Forum

Based on the presentation, coordinators will have a panel discussion, and wrap up the forum giving direction for future conservation of the lake environment.

Date & Time October 16 (Tue.), 2018 9:30-12:00

Room Main Convention Hall, Tsukuba International Congress Center

Contents	Based on the presentation, coordinators will have a panel discussion, and wrap up the forum giving direction for future conservation of the lake environment.
Coordinator	Saburo Matsui (Chairperson, 17th World Lake Conference Project Promotion Committee)
Panelists	Kazuhiko Oigawa (Governor, Ibaraki Prefecture) Director-General, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Director-General, Environmental Management Bureau, Ministry of the Environment (MOE) Research Councillor, Council's Secretariat, Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture, Forestry and Fisheries (MAFF) Keith Alverson (Director, United Nations Environment Programme International Environmental Technology Center (UNEP IETC)) Gábor Molnár (Managing director, Lake Balaton Development Coordination Agency)

(5) Lakes Session

Citizens, administrators, researchers, and other individuals concerned of lake regions in Japan and other countries will discuss and share their specific and common problems, achievements and challenges in various aspects of lake basin management.

Theme “Harmonious Coexistence of Humans and Lakes -Collaboration within Lakes basin towards Sustainable Ecosystem Services-”

◆ Lakes Session (World Lakes Session)

Date & Time October 15 (Mon.), 2018 14:30-17:00

Room Main Convention Hall, Tsukuba International Congress Center

Schedule



Time	Contents	Outline
14:30-15:30	Case Study Presentation	Case study presentation (3 presentations, 20 mins each)
15:30-15:50		Coffee Break
15:50-16:10	Panel Discussion	Comment on case study presentation by commentator (2 commentators, 10 mins each)
16:10-17:00		-Discussion by Panelists and the coordinator. -Opinion and information exchange -Summary of the session

Contents

-Case Study Presentation

Contents	Introduction of case studies in Oceania, Africa, and Latin America regarding the current state future development and the procedure of lake basin management.	
Presentation 1 (20 mins)	Colin Finlayson	Professor, Charles Sturt University 
Presentation 2 (20 mins)	Daniel Olago	Professor, University of Nairobi 
Presentation 3 (20 mins)	Alejandro Juárez Aguilar	Chief Executive Officer, Institute Corazon de la Tierra 

-Panel Discussion

Contents	Discussion on the movement of lakes in the world and ecosystem services.	
Coordinator	Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation (ILEC)
Panelists	○ Commentators	
	• Ajit Pattnaik	Vice president, Wetlands International South Asia 
	• Walter Rast	Professor Emeritus, Texas State University 
	○ Presenters of Case Studies	
	• Colin Finlayson	Professor, Charles Sturt University
	• Daniel Olago	Professor, University of Nairobi
	• Alejandro Juárez Aguilar	Chief Executive Officer, Institute Corazon de la Tierra

◆ Lakes Session (Japanese Lakes Session)

Date & Time October 16 (Tue.), 2018 13:10-17:15









Room Main Convention Hall, Tsukuba International Congress Center

Schedule





Time	Contents	Outline
13:10-14:30	Case Study Presentation	Case study presentation (8 presentations, 10 mins each)
14:30-14:50	Q & A	Questions from audience
14:50-15:20	Coffee Break	
15:20-16:15	Panel Discussion	Introduction by the coordinator (5 mins) Presentation by panelists (5 presentations, 10 mins each)
16:15-17:15		-Discussion by panelists and the coordinator. -Opinion and information exchange -Summary of the session

Contents

-Case Study Presentation (8 presentations, 10 mins each)

Contents	Presentation on the shift and achievements of activities in Lake Kasumigaura and the development of solutions for ongoing issues since the 6th World Lake Conference.		
Presentation 1 (10 mins)	Yaeko Yahagi	Vice Chairperson, 2018 Citizens' Association that works closely with the World Lake Conference *Report from Ibaraki-machi Satellite venue	
Presentation 2 (10 mins)	Seiji Sakuraba	Vice Chair, World Lake Conference Satellite Working Group, Executive Committee of Mito City Environmental Fair 2018 *Report form Mito City Satellite venue	
Presentation 3 (10 mins)	Koki Ozaki	Invasive Alien Aquatic Weed Removal Management Team Manager, Nonprofit Organization International Volunteer University Student Association(IVUSA)	
Presentation 4 (10 mins)	Akihiko Kondoh	Professor, Center for Environmental Remote Sensing, Chiba University	
Presentation 5 (10 mins)	Makoto Onishi	Chief Technology Officer, Water Solutions Division, Water Business Unit, Hitachi, Ltd.	
Presentation 6 (10 mins)	Naoki Komatsu	Director General, Shiga Prefectural Government	
Presentation 7 (10 mins)	Naoteru Odano	Director-General for Regional Revitalization and Comprehensive Strategy, Semboku City, Akita Prefecture	
Presentation 8 (10 mins)	Mitsuru Izumo	CEO, euglena Co.ltd.,	

-Panel Discussion

Contents	Discussion on how to collaborate among related organizations to promote the collaboration within lakes basin towards sustainable ecosystem services.		
Coordinator	Takehiko Fukushima	Director, Ibaraki Kasumigaura Environmental Science Center	
Panelists	○ Panelists		
	- Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation (ILEC)	
	- Kazuya Kumagai	Director, Water Environment Division, Environmental Management Bureau, Ministry of the Environment	
	- Masashi Iwai	Senior Deputy Director, River Environment Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism	
	- Shinji Ide	Professor, School of Environmental Science, the University of Shiga Prefecture	
	- Noboru Okuda	Associate Professor, Research Institute for Humanity & Nature	
	○ Presenters of Case Studies		
	- Koki Ozaki	Invasive Alien Aquatic Weed Removal Management Team Manager, Nonprofit Organization International Volunteer University Student Association(IVUSA)	
	- Makoto Onishi	Chief Technology Officer, Water Solutions Division, Water Business Unit, Hitachi, Ltd.	

(6) Lake Kasumigaura Session




Stakeholders in the Kasumigaura region will discuss specific actions in effort to maintain sustainable ecosystem services.

Theme	"Future Vision of Lake Kasumigaura"
Date & Time	October 18 (Thu.), 2018 9:30 – 17:00
Room	Main Conference Hall, Tsukuba Congress Center
Schedule	



Time	Contents	Outline
9:30-10:15	Case Study Presentation 1	Case study presentation (3 presentations, 15 mins each)
10:15-10:30	Q & A	Questions from audience
10:30-10:50	Coffee Break	
10:50-11:40	Case Study Presentation 2	Case study presentation (5 presentations, 10 mins each)
11:40-11:55	Q & A	Questions from audience
12:00-14:00	Poster Presentation	At foyer of Main Convention Hall
14:05-14:55	Case Study Presentation 3	Case study presentation (5 presentations, 10 mins each)
14:55-15:10	Q & A	Questions from audience
15:10-15:30	Coffee Break	
15:30-17:00	Panel Discussion	<ul style="list-style-type: none"> -Comments on case study presentation by panelists -Discussion by panelists and the coordinator. -Opinion and information exchange -Summary of the session


Contents

-Case Study Presentation 1





Contents	Presentation on the shift and achievements of activities in Lake Kasumigaura and the development of solutions for ongoing issues since the 6th World Lake Conference.		
Presentation 1	Mieko Kuwana	Executive Director, Department of Residential and Environmental Affairs, Ibaraki prefectural Government	
Presentation 2	Tsuyoshi Tatsuno	General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT)	
Presentation 3	Kazuhiro Ebata	Vice President, Ibaraki Kasumigaura Environmental Science Center	

-Case Study Presentation 2

Contents	Current situation, issues and solutions in Lake Kasumigaura by those who have benefitted from the lake.		
Presentation 1	Ichiro Ito	Group Director, Kasumigaura Marine Products Research Group, Kasumigaura Fishermen's Association	
Presentation 2	Masami Iida	Section of lotus root in Japan Agricultural Cooperatives Tsuchiura	

Presentation 3	Kenya Tada	Director, Nippon Steel & Sumitomo Metal Corporation KASHIMA WORKS, Safety, Environment & Plant Safety Division	
Presentation 4	Hirotsugu Konno	Kasumigaura Mirai Creation Company	
Presentation 5	Masako Fujiwara	President, Ibaraki Life School Liaison Committee	

-Case Study Presentation 3

Contents	Presentation by residential groups and summary of the satellite venues		
Presentation 1	Toshio Takishita	Vice President, 2018 Citizens' Association that works closely with the World Lake Conference	
Presentation 2	Akira Abe	Chair, Kasumigaura Citizens' Association/ Chair, Executive Committee of Satellite Tsuchiura *Report from Tsuchiura city Satellite venue	
Presentation 3	Takashi Chiba	Chief clerk (Curator), Kasumigaura city museum of history *Report from Kasumigaura city Satellite venue	
Presentation 4	Shigeo Oki	Chair, Council for the Promotion of Hokota City Development Nature Environment Sectional Meeting *Report from Hokota city Satellite venue	
Presentation 5	Taichi Sukegawa	Student, Ibaraki Prefectural Takezono High School *Report from presentation groups at Student Conference	

-Panel Discussion

Contents	Discussion the specific actions towards sustainable ecosystem services with sharing the problems and issues in Lake Kasumigaura throughout the case studies.		
Coordinator	Takehiko Fukushima	Director, Ibaraki Kasumigaura Environmental Science Center	
Panelists	- Masahisa Nakamura - Mieko Kuwana - Tsuyoshi Tatsuno - Ichiro Ito - Kenya Tada - Hirotsugu Konno - Toshio Takishita	Vice President, International Lake Environment committee Foundation(ILEC) Executive Director, Department of Residential and Environmental Affairs, Ibaraki prefectural Government General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Group Director, Kasumigaura Marine Products Research Group, Kasumigaura Fishermen's Association Director, Nippon Steel & Sumitomo Metal Corporation KASHIMA WORKS, Safety, Environment & Plant Safety Division Kasumigaura Mirai Creation Company Vice President, 2018 Citizens' Association that works closely with the World Lake Conference	

◆ Lake Kasumigaura Session (Poster)

Date & Time	< Free Browsing >
	October 18 (Thur.) 9:00-17:00
	< Core Time >
	[Presentation ID - odd number] October 18 (Thur.) 12:00-13:00
	[Presentation ID - even number] October 18 (Thur.) 13:00-14:00
Venue	Foyer of Main Convention Hall, Tsukuba International Congress Center

Program

KP-1	AIMING FOR WATER ENVIRONMENTAL LEARNING WANTED BY PARTICIPANT Yuki Nagate (Environmental Conservation Section, Civic Life Division, Tsuchiura City, Japan)
KP-2	LAKE KASUMIGAURA AS A TOURIST RESOURCE Motohide Akutsu (Tsuchiura City Office Commerce and Tourism Division, Japan)
KP-3	CITY PROMOTION PROJECTS MAKING USE OF KASUMIGAURA LAKE Tomoko Muto (Public Relations Division, Tsuchiura City, Japan)
KP-4	EFFORTS TO ENCOURAGE INSTALLATION OF ADVANCED TREATMENT TYPE JOHKASOU Kouhei Usami (Environmental Conservation Section, Civic Life Division, Tsuchiura City, Japan)
KP-5	EFFECT OF DOMESTIC WASTEWATER COUNTER MEASURES BY TSUCHIURA CITY Takashi Fujiwara (Environmental Conservation Section, Civic Life Division, Tsuchiura City, Japan)
KP-6	STUDY OF SURVEY ON THE WATER QUALITY OF THE INFLUX CHANNEL OF HOUSEHOLD WASTEWATER INFLOWING THE BIZEN RIVER Yusuke Komatsuzaki (Environmental Conservation Section, Civic Life Division, Tsuchiura City, Japan)
KP-7	EFFORTS OF WORKSPACES AND FACTORIES WASTEWATERS COUNTER MEASURES BY TSUCHIURA CITY Hiroki Nagamine (Environmental Conservation Section, Civic Life Division, Tsuchiura City, Japan)
KP-8	SURVEYS OF RIVER WATER QUALITY FLOWING INTO KASUMIGAURA CONDUCTED BY CITIZENS Yoshiko Ito (Council to Improve the Water Quality of Lake Kasumigaura, Japan)
KP-9	COUNCIL TO IMPROVE THE WATER QUALITY OF LAKE KASUMIGAURA Kiyoshi Miyamoto (Council to Improve the Water Quality of Lake Kasumigaura, Japan)
KP-10	KOISE RIVER EXPEDITION TEAM Hishiko Kamei (Liaison Conference of Koise River Expedition Team, Japan)
KP-11	BIODIVERSITY ACTIVITIES AT SONOBE RIVER Isamu Hanyuu (The Yokohama Rubber Co., Ltd. Ibaraki plant, Japan)
KP-12	CONSERVATION ACTIVITIES OF WATER SOURCE IN SHISHITUKA SATOYAMA WOODLAND. TUCHIURA CITY, IBARAKI JAPAN Hiromi Oikawa (Certified Non-profit Organization for Nature conservation and history transmission of Shishituka Satoyama, Japan)
KP-13	CITIZEN'S MONITORING AND CONSERVATION ACTIVITIES OF FRESHWATER FISH IN LAKE KASUMIGAURA Takahiro Morosawa (Tsuchiura Nature Conservation Society, Japan)

*Affiliation and presenters' Information is based on submission.

- KP-14 THE FOUR ALIEN SPECIES, DEEP BODY BITTERLING *ACHEILOGNATHUS MACROPTERUS*, YELLOW CATFISH *PSEUDOBAGRUS FULVIDRACO*, WUCHANG BREAM *MEGALOBrama AMBLYCEPHALA* AND MOSQUITOFISH *GAMBUSIA AFFINIS*, ESTABLISHED IN THE LAKE KASUMIGAURA SYSTEM AFTER 2000, JAPAN
Tomiji Hagiwara (Tsuchiura Nature Conservation Society, Japan)
- KP-15 INFORMATION REGARDING THE PRACTICAL EDUCATION PROJECTS FOR CITIZENS ON KASUMIGAURA LAKE WATER PURIFICATION
Tetsuo Awano (Executive committee for Kasumigaura Lake's waterfront discovery activities, Japan)
- KP-16 BACTERIAL PRODUCTION AND CARBON BUDGET AT THE CENTER OF LAKE KASUMIGAURA, JAPAN
Kenji Tsuchiya (National Institute for Environmental Studies, Japan)
- KP-17 LONG-TERM TRENDS IN POPULATION DENSITIES OF CHIRONOMID LARVAE IN LAKE KASUMIGAURA (LAKE NISHIURA), IBARAKI PREFECTURE, JAPAN
Ryoji Nakazato (Center for Water Environment Studies, Ibaraki University, Japan)
- KP-18 WATER QUALITY AND MICROBIAL COMMUNITY IN BOTTOM SEDIMENT CORRESPONDING TO A DEPTH LEVEL IN LAKE KASUMIGAURA
Ikuo Tsushima (Public Works Research Institute, Japan)
- KP-19 IDENTIFYING SOURCES AND METABOLISM OF NITRATE FROM ANALYSIS OF $\delta^{15}\text{N}$, $\delta^{18}\text{O}$ AND $\Delta^{17}\text{O}$ STABLE ISOTOPE ABUNDANCES IN FOREST AND RICE PADDY WATERSHED AROUND MT. TSUKUBA, JAPAN
Yasuhiro Nakajima (Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (NARO) / Advanced Analysis Center, National Agriculture and Food Research Organization (NARO), Japan)
- KP-20 RECLAMATION OF FORESHORE WITH EFFECTIVE USE OF DREDGED SOIL
Toshiharu Kataoka (Director of Environment Division, Tonegawa-Karyu Integrated Operation and Maintenance Office, Japan Water Agency, Japan)
- KP-21 CHANGES IN WATER QUALITY IN LAKE KASUMIGAURA FOUND BY THE MONITORING DATA
Kazuhiro Komatsu (National Institute for Environmental Studies, Japan, Japan)
- KP-22 INFLUENCE OF LIGHT WAVELENGTH AND INTENSITY ON GEOSMIN PRODUCTION OF *STREPTOMYCES COELICOLOR* A3(2)
Motoo Utsumi (Faculty of Life and Environmental Sciences, University of Tsukuba, Japan)
- KP-23 WATER ENVIRONMENT IN THE SAKURAGAWA RIVER BASIN UNDER THE ADVANCED WATER CIRCULATION MECHANISM OF LAKE KASUMIGAURA, VISUALIZATION OF ACTUAL WATER QUALITY BY MULTIPOINT ELECTRIC CONDUCTION OBSERVATION
Shinpei Yoshikawa (Graduate school of Daido University, Japan)
- KP-24 SEDIMENTARY RECORD OF TSUNAMIS AND FLOODS IN LAKE KASUMIGAURA, JAPAN
Yoshio Inouchi (Faculty of Human Sciences, Waseda University, Japan)
- KP-25 ACTIVITIES AND ROLE OF KASUMIGAURA ACADEMIC CIRCLE - INFORMATION EXCHANGE ABOUT LAKE KASUMIGAURA
Yukimi Yamane (Kasumigaura Academic Circle, Japan)
- KP-26 CURRENT STATUS AND ISSUES OF WATER ENVIRONMENT OF SAKURAGAWA RIVER AIM FOR WATER QUALITY IMPROVEMENT
Chiharu Kumada (Jiyu Gakuen College / University of Taisho, Japan)
- KP-27 CHANGES IN RAINWATER DRAINAGE BURDEN TO NEIGHBORING LAKES BY GROWTH OF TSUKUBA SCIENCE CITY
Ken Nakamura (University of Tsukuba, Japan)

- KP-28 BIRDS BELONGING TO THE FAMILY CHARADRIIFORMES ON THE SHORE OF LAKE KASUMIGAURA
Tomoharu Nojiri (Sakai Town Office, Japan)
- KP-29 BIRD NET MANAGEMENT AFFECTS THEIR INVERSION TO THE FIELD AND YIELD LOSS OF LOTUS PRODUCTION IN LATE KASUMIGAURA BASIN
Masakazu Komatsuzaki (Center for International Field Agriculture Research & Education, Ibaraki University, Japan)
- KP-30 DAMAGE TO WILD BIRDS CAUSED BY NETS ON LOTUS LOTUS FIELDS.
~THE REASON WHY LAKE KASUMIGAURA CANNOT BECOME A RAMSAR SITE~
Machiko Kanazawa (Wild Bird Society of Japan, Japan)
- KP-31 THE PER CAPITA RUNOFF CHANGE ANALYSIS IN A WATERSHED-AN EXAMPLE OF LAKE KASUMIGAURA BASIN
Ma Donglai (University of Tsukuba, China)
- KP-32 LONG-TERM TREND OF CHIRONOMID LARVAE IN LAKE KITAURA
Soeun Park (Center for Water Environment Studies, Ibaraki University, Japan)
- KP-33 EFFECTS OF LANDUSE AND LIVESTOCK-RELATED FACILITIES ON GROUNDWATER NITRATE CONCENTRATION IN HOKOTA REGION
Sadao Eguchi (Institute for Agro-Environmental Sciences, NARO, Japan)
- KP-34 HOW MUCH INFORMATION ABOUT LAKE KASUMIGAURA CAN WE OBTAIN USING A WEB APPLICATION OF CLIMATES OF GLOBAL LAKE BASINS: CGLB?
Tosiyuki Nakaegawa (Meteorological Research Institute, Japan)
- KP-35 PROVISION OF GEOSPATIAL INFORMATION CONTRIBUTING TO VARIOUS EFFORTS FOR MANAGING LAKE KASUMIGAURA
Masami Nemoto (Geospatial Information Authority of Japan, Ministry of Land, Infrastructure, Transport and Tourism, Japan)

(7) Technical Sessions

Researchers and civil groups will present and discuss their papers and activity results in 9 technical sessions.

		Technical Session 1	Technical Session 2	Technical Session 3	Technical Session 4
Venue		Convention Hall 200	Conference Room 201A	Convention Hall 300	Conference Room 404
Date & Time					
Oct. 16	9:00-10:20	〈Section 1〉 Biodiversity 1	〈Section 1〉 Water Resources and Water Quality	〈Section 1〉 Water Quality Restoration Technology	〈Section 1〉 Activities and Conservation of Riparian Areas
	10:20-10:40		Break		
	10:40-12:00	〈Section 2〉 Biodiversity 2	〈Section 2〉 Environmental Change Impacts on Water Resources	〈Section 2〉 Lake Ecosystem Monitoring 1	〈Section 2〉 The History and Citizens' Activities around Kasumigaura
	12:00-14:00		Break		
	14:00-15:20	〈Section 3〉 Biodiversity 3	〈Section 3〉 Lake Condition and Management	〈Section 3〉 Lake Ecosystem Monitoring 2	〈Section 3〉 The Sustainable Tourism Community Planning
	15:20-15:40		Break		
	15:40-17:00	〈Section 4〉 Ecosystem Services	〈Section 4〉 Watershed Change and Water Resources	〈Section 4〉 Dynamics of Phytoplankton and Water Blooms 1	〈Section 4〉 Water System and Life Culture in Asia

		Technical Session 1	Technical Session 1	Technical Session 3	Technical Session 3
Venue		Convention Hall 200	Conference Room 201A	Convention Hall 300	Conference Room 404
Date & Time					
Oct. 18	9:00-10:20	〈Section 5〉 Biodiversity 4	〈Section 9〉 Fisheries 1	〈Section 5〉 Dynamics of Phytoplankton and Water Blooms 2	〈Section 9〉 Behavior and Countermeasure of Hazardous Chemicals
	10:20-10:40		Break		
	10:40-12:00	〈Section 6〉 Biodiversity 5	〈Section 10〉 Fisheries 2 ※10:40-11:20	〈Section 6〉 Effect of Climate Change	〈Section 10〉 Water Quality Monitoring 1
	12:00-14:00		Break		
	14:00-15:20	〈Section 7〉 Invasive Alien Species 1	〈Section 11〉 Conservation, Management and Restoration 1	〈Section 7〉 Dynamics of Organic Matter	〈Section 11〉 Water Quality Monitoring 2 ※14:40-15:20
	15:20-15:40		Break		
	15:40-17:00	〈Section 8〉 Invasive Alien Species 2	〈Section 12〉 Conservation, Management and Restoration 2	〈Section 8〉 Sediment and Primary Production	〈Section 12〉 Various Issues Associated with Lake Ecosystem

Technical Session 5	Technical Session 6	Technical Session 7	Technical Session 8	Technical Session 9
Conference Room 202A	Conference Room 303	Conference Room 406	Conference Room 201B	Conference Room 304
〈Section 1〉 Stable Isotope Ratio	〈Section 1〉 Environmental Monitoring	〈Section 1〉 Monitoring and Restoration of Lake Water Environment	〈Section 1〉 Participation and Collaboration 1	〈Section 1〉 Lake-River-Coastal Basin Governance ※9:40-10:20
		Break		
〈Section 2〉 Nitrogen Contamination and Ammonia Volatilization	〈Section 2〉 Analysis of Long-term Monitoring Data	〈Section 2〉 Ecosystem Service	〈Section 2〉 Participation and Collaboration 2	〈Section 2〉 ILBM and Lake Basin Governance 1
		Break		
〈Section 3〉 Water Purification Measures	〈Section 3〉 Measurement Method	〈Section 3〉 Ecotoxicity	〈Section 3〉 Participation and Collaboration 3	〈Section 3〉 ILBM and Lake Basin Governance 2
		Break		
〈Section 4〉 Circulation Irrigation and New Agricultural Technology	〈Section 4〉 Monitoring Lakes by Remote Sensing	〈Section 4〉 Water Treatment	〈Section 4〉 Participation and Collaboration 4	〈Section 4〉 ILBM Institutions and Their Typology 1

Technical Session 5	Technical Session 6	Technical Session 7	Technical Session 8	Technical Session 9
Conference Room 202A	Conference Room 303	Conference Room 406	Conference Room 201B	Conference Room 304
〈Section 5〉 Forest Management	〈Section 5〉 Monitoring of Human Impacts	〈Section 5〉 Conservation and Pollution Control	〈Section 5〉 Ecological Conservation	〈Section 5〉 Ecosystem Service Assessment 1
		Break		
〈Section 6〉 Phosphorus Cycle	〈Section 6〉 Monitoring of Emerging Pollutants	〈Section 6〉 Wastewater Treatment	〈Section 6〉 Education Program and Practice 1	〈Section 6〉 Ecosystem Service Assessment 2
		Break		
〈Section 7〉 Biomass	〈Section 7〉 Data Analysis and Modeling	〈Section 7〉 Wastewater Treatment/ Aquatic Plant	〈Section 7〉 Education Program and Practice 2	〈Section 7〉 Climate Change Impact
		Break		
〈Section 8〉 Chemical Substances ※15:40-16:40	〈Section 8〉 Dynamics of Plankton and Dissolved Organic Matter	〈Section 8〉 Sanitation and Appropriate Technology	〈Section 8〉 Education Program and Practice 3	〈Section 8〉 ILBM Institutions and Their Typology 2

◆ Technical Session (Oral)

Program

Technical Session 1: Biodiversity and Biological Resources

This session focuses on evaluation and conservation issues regarding biodiversity and biological resources services in lakes, wetlands, rivers and riparian areas.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Convention Hall 200 (October 16, October 18),
Conference room 201A (October 18)

October 16 (Convention Hall 200)

9:00-10:20 Section 1 “Biodiversity 1”

Chair: Takehito Yoshida (Research Institute for Humanity and Nature/University of Tokyo)

- O1-1 VERTICAL DISTRIBUTION OF PHYTOPLANKTON AND THEIR RELATIONSHIP WITH WATER QUALITY IN MAE KUANG RESERVOIR, CHIANG MAI, THAILAND
Tatporn Kunpradid (Biology Department, Faculty of Science and Technology, Chiang Mai Rajabhat University / Centre of Excellence of Biodiversity Research and Implementation for Community, Chiang Mai Rajabhat University, Thailand)
- O1-2 RELATIONSHIP BETWEEN PHYTOPLANKTON COMMUNITY STRUCTURE AND WATER QUALITY IN THE LAKE GOLD COAST, NORTH JAKARTA
Aliati Iswantari (Bogor Agricultural University, Indonesia)
- O1-3 LITTORAL PHYTOPLANKTON COMMUNITY IN LAKE LANA O, MARAWI CITY, PHILIPPINES
Husna Abdullah Dimapalao (Mindanao State University, Philippines)
- O1-4 THE TYPOLOGY AND TAXONOMIC DIVERSITY OF THE ABKHAZIA REPUBLIC LAKES AND RIVERS (CAUCASUS)
Nafisa Mingazova (Kazan (Volga region) Federal University, Russia)

10:40-12:00 Section 2 “Biodiversity 2”

Chair: Takehito Yoshida (Research Institute for Humanity and Nature/University of Tokyo)

- O1-5 DNA BARCODING REVEAL THE CURRENT STATUS UNEVALUATED SPECIES OF *RASBORA SP* (CYPRINIDAE) FROM BERATAN LAKE, BALI
Gde Raka Kartika Kartika (Udayana University, Bali, Indonesia)
- O1-6 DEVELOPMENT OF SPECIFIC MARKERS FOR MONITORING DISTRIBUTION OF SPOTTED BARB (*BARBODES BINOTATUS*) USING EDNA ANALYSIS
Sekar Larashati (Research Center for Limnology, Indonesian Institute of Sciences (LIPI), Indonesia)
- TS1-1** NATIVE JAPANESE STRAIN OF THE COMMON CARP (*CYPRINUS CARPIO*): A
Invited Lecture PRECIOUS NATURAL HERITAGE REMAINING IN LAKE BIWA
Kohji Mabuchi (Lake Biwa Branch Office, National Institute for Environmental Studies, Japan)

*Affiliation and presenters' Information is based on submission.

14:00-15:20 Section 3 “Biodiversity 3”

Chair: Masatoshi Denda (PUBLIC WORKS RESEARCH INSTITUTE)

- O1-7 PREDICTING CLIMATE CHANGE IMPACT ON ZOOPLANKTON COMMUNITY STRUCTURE BASED ON THERMALLY POLLUTED LAKES
Marcin Dziuba (Adam Mickiewicz University in Poznan, Poland)
- O1-8 ZOOPLANKTON ABUNDANCE AND BIOMASS SIZE SPECTRA IN SHALLOW URBAN LAKES: ANALYSIS USING LASER OPTICAL PLANKTON COUNTER
Reliana Lumban Toruan (University of Western Australia / Research Centre for Limnology, Indonesian Institute of Sciences, Indonesia)
- O1-9 ZOOPLANKTON IN ASSESSING OF THE WATER QUALITY IN URBAN AREAS
Olga Yurjevna Derevenskaia (Kazan Federal University, Russia)
- O1-10 ZOOPLANKTON COMMUNITIES IN LAKE NASSER UNDER CURRENT FLOOD REGIME BEFORE THE IMPLICATIONS OF GRAND ETHIOPIAN RENAISSANCE DAM (GERD) CONSTRUCTION
Mahmoud H Hegab (Freshwater and Lakes Division, National Institute of Oceanography and Fisheries, Egypt)

15:40-17:00 Section 4 “Ecosystem Services”

Chair: Hiroya Yamano (National Institute for Environmental Studies Center for Environmental Biology and Ecosystem Studies)

- O1-11 STATUS OF SOME WETLANDS FROM SOUTH WESTERN MAHARASHTRA-INDIA WITH SPECIAL REFERENCE TO FLORISTIC AND AVIAN DIVERSITY, ECOSYSTEM BENEFITS, THREATS AND MANAGEMENT STRATEGIES
Chandrakant Baburao Salunkhe (Krishna Mahavidyalaya, India)
- O1-12 FISHERMAN'S WILLINGNESS TO PAY FOR SUSTAINABLE ECOSYSTEM MANAGEMENT OF JAFFNA LAGOON
Sooriyakumar Krishnapillai (Department of Agricultural Economics, Faculty of Agriculture, University of Jaffna, Sri Lanka)
- O1-13 CAN SCIENTIFIC EVIDENCE TO DEPICT THE ECOSYSTEM SERVICES EFFECTIVELY RESOLVE THE CONFLICT BETWEEN THE PROTECTED AREA MANAGERS AND THE LOCAL DEPENDENT COMMUNITY? NALABANA BIRD SANCTUARY; CHILIKA LAKE A WETLAND OF INTERNATIONAL IMPORTANCE, INDIA; A CASE STUDY
Ajit Kumar Pattnaik (Wetlands International South Asia / Scientific Committee, ILEC Foundation, India)
- O1-14 ECONOMIC EVALUATION OF ECOSYSTEM SERVICES OF LAKE KASUMIGAURA AND ISSUES WITH THE EVALUATION METHOD
Tatsumi Kitamura (Ibaraki Kasumigaura Environmental Science Center, Japan)

October 18 (Convention Hall 200)

9:00-10:20 Section 5 “Biodiversity 4”

Chair: Jun Nishihiro (Toho University)

- O1-15 *TERMINALIA ARJUNA* AS A RIPARIAN SPECIES TO THE PROTECTION ALONG THE LAKE, TANK AND CATCHMENT AREAS IN SRI LANKA
D.A.B.N Amarasekera (Department of crop science, Faculty of Agriculture, University of Ruhuna, Sri Lanka)
- O1-16 THE PRESENT CONDITION OF THE LAKEFRONT VEGETATION IN KASUMIGAURA
Masato Ono (Ministry of Land, Infrastructure, Transport and Tourism, Kanto Regional Development Bureau, Kasumigaura river office The environment department of lakes and marshes., Japan)

- O1-17 A STUDY ON THE RELATION BETWEEN THE WATER LEVEL IN LAKE BIWA AND THE CHANGE OF THE SUBMERGED PLANT COMMUNITY
Katsuyuki Koga (Japan Water Agency, Japan)
- O1-18 ON INHABITATION OF BIRDS BELONGING TO THE FAMILY CHARADRIIFORMES AND SCOLOPACIDAE IN LOTUS FIELDS ON THE SHORE OF LAKE KASUMIGAURA
Tomoharu Nojiri (Sakai Town Office, Japan)

10:40-12:00 Section 6 “Biodiversity 5”

Chair: Takehito Yoshida (Research Institute for Humanity and Nature/University of Tokyo)

- O1-19 SPECIES RICHNESS AND ENDEMISM OF VERTEBRATE FAUNA IN AND AROUND FOUR LAKES IN AGUSAN DEL SUR, PHILIPPINES
Olga M. Nuneza (Department of Biological Sciences, MSU-Iligan Institute of Technology, Philippines)
- O1-20 THE LIVING CONDITION OF FRESHWATER BIVALE IN KASUMIGAURA LAKE AND ITS CHANGE
Okimichi Suzuki (Japan)

TS1-2 **CURRENT STATUS AND FUTURE RESEARCH OF BIODIVERSITY ASSESSMENT AND ECOSYSTEM CONSERVATION IN JAPANESE LAKES**
Noriko Takamura (National Institute for Environmental Studies, Japan)

Invited Lecture

14:00-15:20 Section 7 “Invasive Alien Species 1”

Chair: Masatoshi Denda (PUBLIC WORKS RESEARCH INSTITUTE)

- O1-21 SPATIAL ANALYSIS OF MACROPHYTES DIVERSITY AND DISTRIBUTION IN A FEW SELECTED LAKES AND RESERVOIRS IN SOUTHEAST ASIA; WITH SPECIAL REFERENCE TO MALAYSIA, INDONESIA AND MYANMAR
Siti Norasikin Ismail (SCHOOL OF BIOLOGICAL SCIENCES, UNIVERSITI SAINS MALAYSIA, Malaysia)
- O1-22 HABITAT CONDITIONS AND STRUCTURES OF RARE RIVERSIDE GRASSLAND PLANT COMMUNITIES ON THE TENRYU-GAWA RIVER SYSTEM IN THE NAGANO PREFECTURE, JAPAN
Miho Nakahara (Shinshu University, Japan)
- O1-23 COUNTERMEASURES FOR OVERGROWTH OF INVASIVE AMPHIBIOUS WATER PRIMROSE: CASE OF LAKE BIWA, JAPAN
Katsuki Nakai (Shiga Prefecture, Japan)
- O1-24 CURRENT STATUS AND COUNTERMEASURES FOR THE INVASIVE FRESHWATER BIVALVE *LIMNOPERNA FORTUNEI* AROUND LAKE KASUMIGAURA, JAPAN
Kenji Ito (Institute for Agro-Environmental Sciences, NARO, Japan)

15:40-17:00 Section 8 “Invasive Alien Species 2”

Chair: Jun Nishihiro (Toho University)

- O1-25 TROPHIC STATUS OF *CHITALA ORNATA* (OSTEICHTHYES; NOTOPTERIDAE), AN INVASIVE FISH SPECIES IN SRI LANKA AND IMPACTS OF ITS INVASION ON FISH DIVERSITY IN TRIBUTARIES OF BENTOTA RIVER
Wimal Ananda Heenatigala Palliya Guruge (DEPARTMENT OF ZOOLOGY, FACULTY OF SCIENCE, UNIVERSITY OF RUHUNA, MATARA, Sri Lanka)
- O1-26 ARE JAPANESE RICE FIELDS THREATENED BY THE NEW INVASIVE ALIEN SPECIES OF TADPOLE SHRIMP (*TRIOPS STRENUUS* WOLF, 1911) FROM WESTERN AUSTRALIA?
Hidetoshi Naganawa (The United Graduate School of Agricultural Science, Gifu University, Japan)

- O1-27 THE WIDESPREAD OF THE REDCLAW, *CHERAX QUADRICARINATUS* IN INDONESIA
Yusli Wardiatno (Bogor Agricultural University (IPB), Indonesia)
- O1-28 ECOLOGICAL BARRIERS AND AQUATIC ECOSYSTEM ISOLATION - THE EFFECT ON MOSQUITO POPULATIONS AND THEIR NATURAL ENEMIES IN CHIANG MAI CITY, THAILAND
Panida Rahong (Environmental Science Program, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand)

October 18 (Conference room 201A)

9:00-10:20 Section 9 "Fisheries 1"

Chair: Kohji Mabuchi (National Institute for Environmental Studies(Lake Biwa Branch Office))

- O1-29 THE STATE OF GHANA'S AQUACULTURE PRODUCTION ON THE VOLTA LAKE AT A GLANCE
Isaac Nyameke (Ghana Aquaculture and Fish Network, Ghana)
- O1-30 SPATIAL AND TEMPORAL VARIATION OF LENGTH-WEIGHT PARAMETERS AND CONDITION FACTORS OF COMMERCIAL FISH SPECIES IN LAKE NASSER, EGYPT
Walid Aly (WorldFish and National Institute of Oceanography and Fisheries, Egypt)
- O1-31 SAMPLING OF FLUCTUATION FACTORS OF THE POPULATION OF *HYPOMESUS NIPPONENSIS* IN LAKE KASUMIGAURA AND EARLY-STAGE POPULATION EVALUATION MODEL
Fumitaka Tokoro (Ibaraki Fisheries Research Institute, Freshwater Branch office, Japan)
- O1-32 "FISH CONSERVATION AREAS AS A TOOL TO STRENGTHEN FRESHWATER COMMUNITY FISHERIES: PROJECT EXPERIENCE FROM THE TONLE SAP"
Pheakdey Sorn (Water and Wetlands Coordinator, IUCN Cambodia, Cambodia)

10:40-11:20 Section 10 "Fisheries 2"

Chair: Kohji Mabuchi (National Institute for Environmental Studies(Lake Biwa Branch Office))

- O1-33 APPLICATION OF A MODEL FOR CARRYING CAPACITY FOR AQUACULTURE TO A BIG OVEREXPLOITED LAKE
Bardukh Gabrielyan (Scientific Center of Zoology and Hydroecology, Armenia)
- O1-34 MASS BALANCED MODEL OF LAKE VOLTA FISHERIES: THE USE OF ECOPATH MODEL
Emmanuel Tetteh-Doku Mensah (CSIR-Water Research Institute, Ghana)

14:00-15:20 Section 11 "Conservation, Management and Restoration 1"

Chair: Takehito Yoshida (Research Institute for Humanity and Nature/University of Tokyo)

- O1-35 THE EVALUATION OF THE FULFILMENT OF THE OBLIGATIONS UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY IN THE SOUTH CAUCASUS
Alla Khosrovyan (University of Cadiz, Armenia)
- O1-36 EFFECTS OF ENVIRONMENTALLY-FRIENDLY FARMING ON BIODIVERSITY IN RICE FIELDS
Naoki Katayama (Institute for Agro-Environmental Sciences, NARO, Japan)
- O1-37 RESTORATION OF A METAPOPULATION OF *ASTER KANTOENSIS* KITAMURA, AN ENDANGERED FLOOD PLAIN PLANT ENDEMIC TO JAPAN
Noboru Wada Kuramoto (School of Agriculture, Meiji University, Japan)

O1-38 A PROPOSED APPLICATION OF TRIBUTARIES FOR AQUATIC PLANT RESTORATION ON THE LAKE BASIN SCALE

Masatoshi Denda (Public Works Research Institute, Japan)

15:40-17:00 Section 12 “Conservation, Management and Restoration 2”

Chair: Hiroya Yamano (National Institute for Environmental Studies Center for Environmental Biology and Ecosystem Studies)

O1-39 MAINSTREAMING BIODIVERSITY INTO INLAND FISHERIES AND AQUACULTURE (WITH SPECIAL FOCUS ON WETLANDS) - SCOPES AND CHALLENGES

Rupam Mandal (Centre for Biodiversity Policy and Law (CEBPOL), National Biodiversity Authority, Ministry of Environment, Forest & Climate Change, Chennai, India)

O1-40 EXAMINATION OF METHODS FOR IMPROVEMENT OF AQUATIC ENVIRONMENT IN THE COASTAL AREAS OF LAKE BIWA USING THE STATE OF BIVALVE POPULATIONS AS AN INDICATOR

Eiso Inoue (Shiga Prefecture, Japan)

O1-41 HABITAT RESTORATION FOR SHIJIMI CLAM USING LOCAL KNOWLEDGE IN THE BRACKISH LAGOON KUGUSHI-KO

Yasushi Miyamoto (Fukui Prefectural Satoyama-Satoumi Research Institute, Japan)

O1-42 SWIMMABLE LAKE KASUMIGAURA BY SATOHAMA MAKING PROJECT

Haruki Ito (Kasumigaura Citizens' Association, Japan)

Technical Session 2: Sustainable Use of Freshwater Resources

This session focuses on the sustainable utilization of freshwater resources, delving into discussion of water quantity-related matters such as the regulation functions of river flow and water balance in watersheds; water quality related matters such as pollution and sediment loads from basins; pollution by chemical compounds; eutrophication; and lake management.

Date & Time October 16 (Tue.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 201A

9:00-10:20 Section 1 “Water Resources and Water Quality”

Chairs: Kunihiro Amano (National Institute for Land and Infrastructure Management)

Toshiharu Kataoka (Tonegawa-Karyu Integrated Operation and Maintenance Office, Japan Water Agency)

O2-1 WATER PURIFICATION FOR PORTABLE WATER USING BIO-FENCE AROUND NYANZA GULF OF LAKE VICTORIA - RESULTS IN LAVICORD PROJECT -

Tomoaki Itayama (Graduate School of engineering, Nagasaki University, Japan)

O2-2 IMPROVEMENT OF WATER QUALITY THROUGH THE KASUMIGAURA CONVEYANCE PROJECT IN SAKURAGAWA RIVER, AND LAKE SENBAKO

Satoshi Kanai (Kasumigaura Conveyance Work Office, Japan)

TS2-1 THE STATE OF THE GLOBAL WATER RESOURCES: HOW SUSTAINABLY DO WE USE THEM?

Invited Lecture

András Szöllősi Nagy (National University for Public Service (NUPS), Hungary)

10:40-12:00 Section 2 “Environmental Change Impacts on Water Resources”

Chairs: Makoto Umeda (Tohoku University)

Kunihiko Amano (National Institute for Land and Infrastructure Management)

- O2-3 ASSESSING THREATS TO TRANSBOUNDARY LAKES AND RESERVOIRS
Walter Rast (Meadows Center for Water and Environment, Texas State University,
Texas USA and ILEC Scientific Committee, Japan, United States of America)
- O2-4 SENSITIVITY ANALYSIS OF STRUCTURE OF THE STRATIFICATION IN LAKE BIWA
BY CHANGING METEOROLOGICAL ELEMENTS
Jinichi Koue (Graduate school of Engineering, Osaka University, Japan)
- O2-5 SUSTAINABILITY CHALLENGES IN EGYPT UNDER LIMITED AND THREATENED
WATER RESOURCES
Talaat Tahir El-Gamal (Water Management Research Institute - National Water
Research Center, Egypt)
- O2-6 CLIMATE ACTION IN LAKES OF HAOR BASIN OF BANGLADESH
Sanowar Hossain (Bangladesh POUSH, Bangladesh)

14:00-15:20 Section 3 “Lake Condition and Management”

Chairs: Hiroshi Yajima (Estuary Research Center, Shimane University)

Makoto Umeda (Tohoku University)

**TS2-2 RECENT DEVELOPMENT AND CHALLENGES IN THE MANAGEMENT OF WATER
CYCLE AND WATER RESOURCES OF A BASIN IN JAPAN**

Invited Lecture

**Tsugihiko Watanabe (Graduate School of Global Environmental Studies, Kyoto
University, Japan)**

- O2-7 THE LAKE FUND OF RUSSIAN FEDERATION, SPATIAL HETEROGENEITY AND
ESTABLISHED TRENDS
Anna Izmailova (Institute of Limnology Russian Academy of Sciences, Russia)
- O2-8 INTEGRATED MANAGEMENT APPROACH OF SELANGOR DAM AND EX-MINING
POND TO TO MITIGATE EL-NINO EFFECT ON WATER RESOURCES IN SELANGOR,
MALAYSIA
Mazlan Bin Idrus (Selangor Waters Management Authority, Malaysia)

15:40-17:00 Section 4 “Watershed Change and Water Resources”

Chairs: Hiroshi Yajima (Estuary Research Center, Shimane University)

Sachio Oguri (Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of
Land, Infrastructure, Transport and Tourism)

- O2-9 IMPACT OF LULC CHANGE ON HYDROLOGICAL RESPONSE IN LAKE MANINJAU
CATCHMENT AREA
Iwan Ridwansyah (Research center for limnology, Indonesian Institute of Sciences,
Indonesia)
- O2-10 SUSTAINABLE DEVELOPMENT OF LOCAL COMMUNITY THROUGH LAKE
ECONOMY
Mangesh Kashyap (Society for Environment Education Research and Management
(SEERAM).Maharashtra, Pune, India)
- O2-11 EFFECT OF SOIL TYPE, SLOPE AND LAND USE CHANGE ON SEDIMENT LOAD IN
TONLE SAP LAKE BASINS
Michitaka Sato (Tokyo Institute of Technology, Japan)
- O2-12 THE EFFECTS OF CLIMATE CHANGE TO THE MAJOR SURFACE WATER
RESOURCES AND TREATMENT FACILITIES IN THE WESTERN PART OF
METROPOLITAN MANILA, PHILIPPINES
Benjamin Villa (Maynilad Water Services, Inc., Philippines)

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

This session discusses lake ecosystems' functions such as water quality purification capacity, primary production, organic matter degradation, sediment oxygen consumption, sediment release, and other matters pertaining to water quality in lake and other lentic environments.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Convention Hall 300 (October 16, October 18), Conference room 404 (October 18)

October 16 (Convention Hall 300)

9:00-10:20 Section 1 "Water Quality Restoration Technology"

Chair: Ayato Kohzu (National Institute for Environmental Studies)

- O3-1 APPLICATION OF NON-POWERED WATER CIRCULATION SYSTEM USING WIND AND WIND-DRIVEN CURRENT FOR SHALLOW RESERVOIRS
Yeoju Jang (University of Science and Technology (UST, KICT school), Korea)
- O3-2 OXYGEN NANOBUBBLE MODIFIED LOCAL SOIL (MLS) TECHNOLOGY FOR SEDIMENT REMEDIATION AND LAKE RESTORATION
Gang Pan (Research Center for Eco-environmental Sciences, Chinese Academy of Sciences, Beijing / Nottingham Trent University, UK, China)
- O3-3 REASONABLE SELECTION OF EXPERIMENTAL FIELDS AND EVALUATION METHODS FOR WATER PURIFICATION TECHNOLOGY
Tomohiko Yamagishi (Saitama-ken Environmental Analysis & Research Association, Japan)
- O3-4 A FUNDAMENTAL STUDY OF THE BLUE-GREEN ALGAE COUNTERMEASURES BY WASHOUT EFFECT IN LAKES
Kakinuma Daiki (Dept. of Civil and Environmental Engineering, Graduate School of Science and Engineering Chuo University, Japan)

10:40-12:00 Section 2 "Lake Ecosystem Monitoring 1"

Chair: Motoo Utsumi (University of Tsukuba)

- O3-5 FLOOD PULSE IN A TROPICAL FLOODPLAIN LAKE AND ITS IMPLICATION ON AQUATIC HABITAT DYNAMICS: CASE STUDY IN THE SENTARUM LAKES AREA, KALIMANTAN - INDONESIA
Hidayat Hidayat (Research Center for Limnology, Indonesian Institute of Sciences, Indonesia)
- O3-6 DISSOLVED OXYGEN PROFILES AND ITS PROBLEMS AT LAKE MANINJAU, WEST SUMATERA - INDONESIA
Luki Subehi (Research Centre for Limnology, Indonesian Institute of Sciences, Indonesia)
- O3-7 THE FORMATION OF THERMOCLINE AND ITS INFLUENCE ON WATER QUALITY AT A SUBAQUEOUS BORROW PIT IN LAKE SOTONASAKAURA
Keita Nakagawa (Ibaraki Kasumigaura Environmental Science Center, Japan)
- O3-8 EFFECTS OF THREE GORGES DAM ON SPATIOTEMPORAL DISTRIBUTION OF SILICON IN THE TRIBUTARY: EVIDENCE FROM THE XIANGXI RIVER
Yonghong Bi (Institute of Hydrobiology, Chinese Academy of Sciences, China)

14:00-15:20 Section 3 “Lake Ecosystem Monitoring 2”

Chair: Akio Imai (National Institute for Environmental Studies)

TS3-1

Invited Lecture

THE INTERACTIONS BETWEEN EUTROPHICATION, DAMMING AND CLIMATE CHANGE ON THE ROLE OF INLAND AQUATIC SYSTEMS IN THE GLOBAL CARBON CYCLE

Yves Prairie (UNESCO Chair in Global Environmental Change, Department of biological Sciences, UQAM, Montreal, Canada)

O3-9 DIETARY UTILIZATION OF CYANOBACTERIA BY FISH COMMUNITIES IN LAKE HACHIRO

Megumu Fujibayashi (Akita Prefectural University, Japan)

O3-10 CYANOBACTERIAL CARBON TRANSFER TO HIGHER TROPHIC LEVEL IN EUTROPHIC TAIHU LAKE

Xian Cao (Tohoku University, China)

15:40-17:00 Section 4 “Dynamics of Phytoplankton and Water Blooms 1”

Chair: Kanako Ishikawa (Lake Biwa Environmental Research Institute)

O3-11 EFFECT OF pH NEUTRALIZATION ON PRIMARY PRODUCER DISTRIBUTION IN ACIDOTROPHIC LAKE INAWASHIRO

Kazunori Nakamura (Fukushima Prefectural Centre for Environmental Creation, Japan)

O3-12 DEVELOPMENT OF A BLOOM FORECASTING MODEL FOR *MICROCYSTIS* IN TSUCHIURAIRI BAY, LAKE KASUMIGAURA, JAPAN

Yumi Nagahama (Ibaraki Kasumigaura Environmental Science Center, Japan)

O3-13 WARMING AND EUTROPHICATION EFFECTS ON PHYTOPLANKTON COMMUNITY OF TWO TROPICAL SYSTEMS WITH DIFFERENT TROPHIC STATES - AN EXPERIMENTAL APPROACH

Sandra Maria Feliciano Oliveira Azevedo (Instituto de Biofísica Carlos Chagas Filho, Federal University of Rio de Janeiro, Brazil)

O3-14 EVALUATION OF THE DEGRADATION FUNCTION OF MICROCYSTIN-LR ON SEDIMENT COLLECTED FROM ISAHAYA NEW POND AND ISAHAYA BAY

Kakeru Ruike (Foundation for Advancement of International Science, Japan)

October 18 (Convention Hall 300)

9:00-10:20 Section 5 “Dynamics of Phytoplankton and Water Blooms 2”

Chair: Noriko Tomioka (Center for Regionnal Environmental Research, National Institute for Environmental Studies)

O3-15 INFLUENCE OF ENVIRONMENTAL FACTORS ON CYANOBACTERIAL BIOMASS AND MICROCYSTINS CONCENTRATION IN THE DAU TIENG RESERVOIR, VIETNAM

Luu Thanh Pham (Institute of Tropical Biology, Vietnam Academy of Science and Technology, Viet Nam)

O3-16 LIMNOLOGICAL CHARACTERISTICS, EUTROPHICATION AND CYANOBACTERIAL DOMINANCE IN THREE UGANDAN NATIONAL PARK SHALLOW LAKES

William Okello (National Fisheries Resources Research Institute (NaFIRRI), Uganda)

O3-17 PROPERTIES OF CYANOBACTERICIDAL BACTERIA AND GROWTH INHIBITING BACTERIA ASSOCIATED WITH WATERWEEDS AGAINST *DOLICHOSPERMUM CRASSUM* (CYANOPHYCEAE) CAUSING MUSTY ODOUR PROBLEM IN DRINKING WATER

Taketoshi Shimizu (Water Quality Laboratory, Kobe City Water Works Bureau, Japan)

- O3-18 "ECOSYSTEM HEALTH ASSESSMENT OF POWAI LAKE, MUMBAI, INDIA"
Pramod Bhagwan Salaskar (Dr M.S. Kodarkar Field Station, Powai Lake, Mumbai, India)

10:40-12:00 Section 6 “Effect of Climate Change”

Chair: Kazuya Shimizu (University of Tsukuba)

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| 03-19 | THE INFLUENCE OF EUTROPHICATION ON METHANE PRODUCTION AND ITS POTENTIAL AS A CARBON SOURCE FOR ZOOPLANKTON
Michal Rybak (Department of Water Protection, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Poznań, Poland) |
| 03-20 | LONG-TERM VARIATION OF CO ₂ FLUX AND THE CONTROLLING FACTORS IN ASIA'S LARGEST BRACKISH WATER SYSTEM, CHILIKA LAKE
Pradipta Ranjan Muduli (CHILIKA DEVELOPMENT AUTHORITY, WETLAND RESEARCH AND TRAINING CENTER, India) |
| 03-21 | REGIME SHIFT ANALYSIS FOR UNDERSTANDING THE WATER QUALITY DYNAMICS IN LAKE KASUMIGAURA
Ayato Kohzu (Center for Regional Environmental Research, National Institute for Environmental Studies, Japan) |
| 03-22 | A STUDY OF THE FACTORS OF THE CHANGE OF WATER QUALITY AND THE VERTICAL CIRCULATION OF ALL LAYERS IN LAKE IKEDA
Daisuke Oba (Kagoshima Prefectural Institute of Environmental Research and Public Health, Japan) |

14:00-15:20 Section 7 "Dynamics of Organic Matter"

Chair: Akio Imai (National Institute for Environmental Studies)

TS3-2 **A UNIQUE MICROBIAL LOOP IN THE HYPOLIMNION OF LAKE BIWA WITH**
Invited Lecture **SPECIAL REFERENCE TO LONG-TERM CHANGES IN WATER QUALITY**
 Shin-ichi Nakano (Center for Ecological Research, Kyoto University, Japan)

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| O3-23 | STUDY ON SIMILARITY OF COD FLUCTUATION IN LAKE KASUMIGAURA AND LAKE TEGANUMA
Daiki Terashima (Graduate School of Science and Engineering, Chuo Univesity, Japan) |
| O3-24 | ASSESSMENT OF ORGANIC MATTER INDICATORS IN LAKE BIWA
Kazuhide Hayakawa (Lake Biwa Environmental Research Institute, Japan) |

15:40-17:00 Section 8 "Sediment and Primary Production"

Chair: Kazuhide Hayakawa (Lake Biwa Environmental Research Institute)

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| O3-25 | ANALYSIS ON SEDIMENTARY MECHANISM OF ORGANIC MATTER IN THE COASTAL AREA OF LAKE IZUNUMA
Munehiro Nomura (Graduate School of Engineering, TOHOKU University, Japan) |
| O3-26 | NUTRIENTS AND MOLAR C:N:P RATIOS IN SURFACE SEDIMENTS OF THE SONGKHLA LAGOON SYSTEM IN SOUTHERN THAILAND
Vachira Lheknim (Department of Biology, Prince of Songkla University, Thailand) |
| O3-27 | PHYTOPLANKTON COMMUNITIES AND WATER QUALITY CHARACTERISTICS IN LAKE PALDANG, SOUTH KOREA
Jongkwon Im (Han River Environment Research Center, National Institute of Environmental Research, Korea) |

October 18 (Conference room 404)

9:00-10:20 Section 9 “Behavior and Countermeasure of Hazardous Chemicals”

Chair: Zin’ichi Karube (Department of Biotechnology and Chemistry, Faculty of Engineering, Kindai University)

- O3-29 DEGRADATION OF BISPHENOLS IN THE *PHRAGMITES AUSTRALIS* RHIZOSPHERE
Miki Nakai (University of Osaka, Japan)
- O3-30 DETERMINATION OF CHELATORS IN LAKE WATER USING ULTRA-PERFORMANCE
LIQUID CHROMATOGRAPHY/QUADRUPOLE TIME-OF-FLIGHT MASS
SPECTROMETRY
Sohag Miah (Graduate School of Natural Science and Technology, Division of
Material Chemistry, Kanazawa University, Bangladesh)
- O3-31 CHARACTERISTICS OF PHOSPHORUS SORPTION-DESORPTION BEHAVIOUR
AND EFFECTS OF SALINITY, PH AND TEMPERATURE ON PHOSPHORUS
SORPTION IN SEDIMENTS OF A LARGEST BRACKISH WATER LAGOON, CHILIKA,
SOUTH ASIA - A CASE STUDY
Saroja Kumar Barik (Dept. of Chemistry, School of Applied Sciences, KIIT, Deemed
to be University, India)
- O3-32 CHARACTERISTIC OF THE PHOTOCHEMICAL RELEASE OF PHOSPHATE FROM
RESUSPENDED SEDIMENTS UNDER SOLAR IRRADIATION
Xiaolu Li (Huazhong Agricultural University, China)

10:40-12:00 Section 10 “Water Quality Monitoring 1”

Chair: Qintong Li (Department of Applied Biosciences, Faculty of Life Sciences, Toyo University)

- O3-33 SPATIO-TEMPORAL VARIABILITY OF WATER QUALITY IN A LARGE SHALLOW
LAKE IN SOUTHEAST ASIA: TONLE SAP LAKE, CAMBODIA
Sok Ty (Institute of Technology of Cambodia, Cambodia)
- O3-34 STATUS OF BIOLOGICAL WATER QUALITY OF MAIN RIVERS CONNECTED TO
TONLE SAP LAKE, CAMBODIA
Porsry Ung (Institute of Technology of Cambodia / Tokyo Institute of Technology,
Cambodia)
- O3-35 SURVIVAL OF *ESCHERICHIA COLI* K12 AND DETECTION OF ANTIBIOTIC-RESISTANT
BACTERIA IN TONLE SAP, MEKONG AND BASAC RIVERS
Reasmey Tan (Institute of Technology of Cambodia, Cambodia)
- O3-36 TEMPORAL DYNAMICS OF WATER QUALITY IN TONLE SAP LAKE IN KAMPONG
LOUNG, CAMBODIA, BASED ON HISTORICAL DATA
Marith Mong (Institute of Technology of Cambodia, Cambodia)

14:40-15:20 Section 11 “Water Quality Monitoring 2”

Chair: Koji Hirose (Ibaraki Kasumigaura Environmental Science Center)

- O3-37 LONG-TERM TEMPORAL VARIATION IN LAKE INAWASHIRO WATER QUALITY
Takayuki Satou (Fukushima Prefectural Centre for Environmental Creation, Japan)
- O3-38 WATER QUALITY OF FIVE SELECTED LAKES IN SOUTHERN LUZON, PHILIPPINES
Khristine Laguador Sandoval (Centro Escolar University-Manila, Philippines)

15:40-17:00 Section 12 “Various Issues Associated with Lake Ecosystem”

Chair: Kazuhiro Komatsu (National Institute for Environmental Studies)

- O3-39 GENOMIC ANALYSIS OF TWO ODORIFEROUS *STREPTOMYCES* SP. ISOLATED FROM TROPICAL FRESHWATER OF SOUTHEAST ASIA PROVIDE AN INSIGHT INTO THE IDENTIFICATION OF POTENTIAL TEMPERATURE SENSOR
Nurul Syahirah Shamsol Anuar (University of Tsukuba, Malaysia)
- O3-40 EUTROPHICATION MAPPING OF LOWLAND LAKES IN NEPAL
Prava Pandey (National Lake Conservation Development Committee/Ministry of Culture, Tourism and Civil Aviation, Nepal)
- O3-41 LAKES OF THE CHERNOBYL EXCLUSION ZONE: THE EFFECTS OF LONG-TERM RADIATION EXPOSURE ON AQUATIC BIOTA
Dmitri Gudkov (Institute of Hydrobiology, Ukraine)
- O3-42 ABUNDANCE OF CILIATED PROTOZOANS IN A TROPICAL LAKE: THE CASE OF LAKE LANA O, PHILIPPINES
Camar Pauti Ameril (Mindanao State University-Marawi City, Philippines)

Technical Session 4: Lakeside History and Culture

This session focuses on the wide variety of the roles that lakes play in regard to such topics as history, culture, lifestyles, tourism, and recreation.

Date & Time October 16 (Tue.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 404

9:00-10:20 Section 1 “Activities and Conservation of Riparian Areas”

Chair: Hironobu Wakatsuki (Department of Business Administration, Kinjo College)

TS4-1 TESHIO-PET IN HOKKAIDO IS A SANCTUARY FOR CANOES

Invited Lecture Takaharu Kusano (Teshio-pet Non-Political Organization, Japan)

- O4-1 PROMOTING BICYCLE TOURISM BASED AROUND LAKES ~THE SHIGA PREFECTURAL GOVERNMENT’S EFFORTS AROUND BIWAICHI AND THE COOPERATION BETWEEN LAKES KASUMIGAURA, BIWA AND HAMANA~
Seiji Tsuda (Shiga Prefecture, Japan)
- O4-2 EFFORTS AIMED AT THE REGISTRATION OF THE RAMSAR CONVENTION IN TAM GIANG LAGOON, CENTRAL VIETNAM
Yukihiro Hirai (Department of Geography, Komazawa University, Japan)

10:40-12:00 Section 2 “The History and Citizens’ Activities Around Kasumigaura”

Chairs: Atsushi Numazawa (Kasumigaura Citizens’ Association)

Hiroshi Nagai (Ibaraki Prefectural Archives and Museum)

- O4-3 ENVIRONMENTAL CHANGES AND HUMAN ACTIVITIES DURING JOMON PERIOD AROUND LAKE KASUMIGAURA
Tsubasa Kamei (Tsuchiura archaeology museum / Mt. Tsukuba Area Geopark Promotion council, Japan)
- O4-4 NEVER-ENDING PROVINCE WHERE KASUMIGAURA SUPPORTS SYMBIOSIS BETWEEN PEOPLE AND THE RICH NATURAL ENVIRONMENT
Takashi Chiba (kasumigaura city museum of history curator, Japan)
- O4-5 WATER FRONT INTERCHANGE “THE CITIZENS’ FESTIVAL FOR SWIMMABLE LAKE KASUMIGAURA”
Kazuo Ichimura (Kasumigaura Citizens’ Association, Japan)

- O4-6 LET'S RIDE IN CYCLING PARADISE "IBARAKI!"
- "TSUKUBA KASUMIGAURA RING RING ROAD" CYCLING EVENTS PRACTICE
REPORT -
Koichi Harigae (HMB Outdoor Club, JAPAN Lake Kasumigaura Cycling Team, Japan)

14:00-15:20 Section 3 "The Sustainable Tourism Community Planning"

Chair: Kentaro Tamino (Faculty of Health & Sport Sciences, Ryutsu Keizai University)

**TS4-2 THE SUSTAINABILITY OF RELATIONSHIPS BETWEEN THE LAKE REGIONS
AND TOURISM**

Invited Lecture

Katsumi Yasumura (Otemon Gakuin University, Japan)

- O4-7 DIVERSIFICATION OF USES AND ADJUSTMENT PROBLEMS OF INLAND WATER:
A CASE STUDY OF UPPER YOSHINO RIVER

Sachiko Harada (Mie University, Japan)

- O4-8 A STUDY OF THE WATER PASSING CAPACITY IN TAMAGAWA JOSUI BY FIELD
OBSERVATION AND HYDRAULIC ANALYSIS

Mayuko Shinzawa (Graduate School of Science and Engineering, Chuo University,
Tokyo, Japan)

15:40-17:00 Section 4 "Water System and Life Culture in Asia"

Chairs: Satoshi Nagano (College of Social Sciences, Ritsumeikan University)

Ping Yang (LAKE BIWA MUSEUM)

- O4-9 DHANMONDI LAKE: A CULTURAL ASSIMILATION OF THE CITY DWELLERS

Md Golam Rabbi (Nature Conservation Society, Bangladesh)

- O4-10 IMPACT OF CLIMATE CHANGE ON THE FOLK CULTURE OF HAOR BASIN IN
BANGLADESH

Tapas Ranjan Chakraborty (Jahangirnagar University, Bangladesh)

- O4-11 MANAGEMENT OF MANGROVE FRINGED KOGGALA LAGOON FOR SUSTAINABLE
LIVELIHOOD DEVELOPMENT - CASE STUDY IN SRI LANKA

Indika Rohan Palihakkara (Department of Crop Science, Faculty of Agriculture,
University of Ruhuna, Sri Lanka)

- O4-12 THE SUSTAINABLE APPROACH TO CONSERVE THE RELIGIOUS WATER BODIES
IN WESTERN PART OF INDIA

Nagesh Shankarrao Tekale (Navdrushti, Mumbai, India)

Technical Session 5: Regional Activities and Matter Cycles

This session discusses the nitrogen and phosphorus cycle, and the dynamics of chemical substances, with a focus on how human activities can impact the material cycle in lakes and their basins.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-16:40

Venue Tsukuba International Congress Center, Conference room 202A

October 16

9:00-10:20 Section 1 "Stable Isotope Ratio"

Chair: Kazuya Nishina (National Institute for Environmental Studies)

**TS5-1 TRACING NUTRIENT SOURCES CONTRIBUTING TO HARMFUL ALGAL BLOOMS
AND OTHER ECOLOGICAL PROBLEMS IN AQUATIC SYSTEMS USING A MULTI-
ISOTOPE APPROACH**

Invited Lecture

Carol Kendall (U. S. Geological Survey, United States)

- O5-1 IDENTIFICATION OF NITRATE SOURCES IN GROUNDWATERS OF SILANG-STA. ROSA SUBWATERSHED: TOWARDS THE WATERSHED GOVERNANCE
Osbert Leo Alcantara Privaldos (Laguna Lake Development Authority, National Ecology Center / Institute of Chemistry, University of the Philippines, Philippines)
- O5-2 IDENTIFYING SOURCES OF GROUNDWATER NITRATE USING $\delta^{15}\text{N}_{\text{NO}_3}$ AND $\delta^{18}\text{O}_{\text{NO}_3}$ VALUES IN HOKOTA RIVER WATERSHED, IBARAKI, JAPAN
Saeko Yada (Institute for Agro-Environmental Sciences, NARO, Japan)

10:40-12:00 Section 2 “Nitrogen Contamination and Ammonia Volatilization”

Chair: Motoko Shimura (Western Region Agricultural Research Center, National Agriculture and Food Research Organization)

- O5-3 REGIONAL MONITORING NETWORK IN ATMOSPHERIC AMMONIA CONCENTRATION IN KASUMIGAURA-BASIN IN IBARAKI, JAPAN
Genki Katata (Ibaraki University, Japan)
- O5-4 LOCAL-SCALE SPATIAL DISTRIBUTION OF ATMOSPHERIC AMMONIA CONCENTRATION AND DEPOSITION AROUND A CATTLE FEEDLOT
Tomohiro Kubota (Ibaraki University Graduate School of Agriculture, Japan)
- O5-5 STATUS OF NITRATE POLLUTION IN GROUNDWATER OF THE TOMOE AND HOKOTA RIVER BASINS (IBARAKI, JAPAN) AND ITS CAUSES
Tetsuro Kikuchi (Ibaraki Kasumigaura Environmental Science Center, Japan)
- O5-6 APPLICABILITY OF THE VIRTUAL NITROGEN FACTOR (VNF) OF NITROGEN FOOTPRINT CALCULATION AS AN INDEX OF NITRATE LEACHING IN DIFFERENT HORTICULTURAL CROPS
Takeru Gonai (Horticultural Research Institute, Ibaraki Agricultural Center, Japan)

14:00-15:20 Section 3 “Water Purification Measures”

Chair: Tasuku Kato (Tokyo University of Agriculture and Technology)

- O5-7 UTILIZATION OF COVER CROPS FOR SOIL AND WATER CONSERVATION
Yingting Gong (University of Ibaraki, Japan)
- O5-8 IMPROVEMENT OF NITROGEN REMOVAL RATE ESTIMATION METHOD FOR WETLANDS FOCUSED ON TEMPERATURE FACTORS
Xiaolan Lin (The United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology, Japan)
- O5-9 VERIFICATION OF A SIMPLE WATERSHED LAND-USE MODEL TO ESTIMATE THE NET NUTRIENT LOADS FROM NON-POINT SOURCES TO RIVERS
Seiko Yoshikawa (Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization, Japan)
- O5-10 EVALUATION OF NUTRIENT LOAD REDUCTION BY PRECISION WATER MANAGEMENT FROM PADDY FIELD IN LAKE INBANUMA WATERSHED
Koshi Yoshida (Ibaraki University, Japan)

15:40-17:00 Section 4 “Circulation Irrigation and New Agricultural Technology”

Chair: Koshi Yoshida (Ibaraki University)

- O5-11 ANALYSIS OF WATER AND NUTRIENT MOVEMENT IN A CYCLIC IRRIGATION SYSTEM TO PADDY FIELDS
Takahiro Ishikawa (Department of Biological and Environmental Engineering, Japan)

- O5-12 ASSESSMENT OF BLOCK SCALE RECYCLE IRRIGATION SYSTEM APPLICATION TOWARD WATER ENVIRONMENTAL CONSERVATION IN BOTH WATERSHED AND PADDY FIELDS SCALES AT SHINTONE RIVER BASIN IN KASUMIGAURA
Tasuku Kato (Tokyo University of Agriculture and Technology, Japan)
- O5-13 TO REDUCE DRAINAGE NUTRIENT LOAD FROM PADDY FIELD BY NON-DRAINAGE TRANSPLANTING WITH GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER AT OGATA-MURA 1 NON-DRAINAGE TRANSPLANTING FIELD TEST WITH GNSS STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER
Yoshisada Nagasaka (NARO Tohoku Agricultural Research Center, Japan)
- O5-14 TO REDUCE DRAINAGE NUTRIENTS LOAD FROM PADDY FIELD BY NON-DRAINAGE TRANSPLANTING WITH GLOBAL NAVIGATION SATELLITE SYSTEM(GNSS) STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER AT OGATA-MURA FOR IMPROVING THE WATER ENVIRONMENT OF LAKE HACHIROKO
Tadashi Kondo (Akita Prefectural University, Japan)

October 18

9:00-10:20 Section 5 “Forest Management”

Chair: Sadao Eguchi (Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization)

TS5-2 FROM LEAVES TO LAKES: REVEALING THE NITROGEN DYNAMICS USING STABLE ISOTOPE TECHNIQUES

Invited Lecture

Nobuhito Ohte (Biosphere Informatics Laboratory, Department of Social Informatics, Graduate School of Informatics, Kyoto University, Japan)

- O5-15 FORMULATION OF FOREST MAINTENANCE GUIDELINES FROM THE VIEWPOINT OF CONSERVATION AND REGENERATION OF LAKE BIWA
Osamu Tanaka (Shiga Prefecture, Japan)
- O5-16 SOIL ENVIRONMENTAL CONDITION AND VEGETATION RECOVERY OF THE ABANDONED CROPLAND AROUND KOMADO-SHITSUGEN MOOR, FUKUSHIMA PREFECTURE
Nobuo Sakagami (College of Agriculture, Ibaraki University, Japan)

10:40-12:00 Section 6 “Phosphorus Cycle”

Chair: Masaru Yamaoka (National Agriculture and Food Research Organization)

- O5-17 PHOSPHORUS RUNOFF LOADS FROM PADDY FIELDS AND FORESTED WATERSHEDS IN SENGARI RESERVOIR BASIN
Masayuki Fujihara (Graduate School of Agriculture, Kyoto University, Japan)
- O5-18 OBSERVATION AND MODELING OF PHOSPHORUS RUNOFF LOADS FROM SENGARI RESERVOIR BASIN
Junichiro Takeuchi (Graduate School of Agriculture, Kyoto University, Japan)
- O5-19 THE SECULAR CHANGE OF PHOSPHORUS CONTENT IN SEDIMENT OF LAKE SUWA
Yutaka Ichikawa (Shinshu University, Japan)
- O5-20 CHEMICAL SPECIES AND BIOAVAILABILITY OF PARTICULATE PHOSPHORUS FROM SOILS
Haruka Adachi (Tokyo University of Agriculture and technology, Japan)

14:00-15:20 Section 7 “Biomass”

Chair: Tomijiro Kubota (National Agriculture and Food Research Organization)

- O5-21 FORMULATION OF MULTIPLE ‘RESOURCES-FROM-BIOWASTE SYSTEM’ MODELS
BASED ON SUBCRITICAL WATER REACTOR
Jun Matsushita (Professor, R/D Initiatives of Chuo University, Japan)
- O5-22 WATER QUALITY CONSERVATION BY CIRCULATIVE USE OF BIOMASS
Yoshito Yuyama (National Agriculture and Food Research Organization, Japan)
- O5-23 DEVELOPMENT OF SLUDGE REDUCTION SYSTEM USING AQUATIC PLANT
BIOMASS
Yukiyo Yamasaki (Public Works Research Institute, Japan)
- O5-24 NITROGEN MINERALIZATION IN PADDY SOIL TREATED WITH THE SLUDGE FROM
LOW-TEMPERATURE ANAEROBIC DIGESTION
Masato Nakamura (National Agriculture and Food Research Organization, Japan)

15:40-16:40 Section 8 “Chemical Substances”

Chair: Hisao Kuroda (Ibaraki University)

- O5-25 RISK ASSESSMENT OF PERSISTENT ORGANIC POLLUTANTS IN A SMALL
CATCHMENT
Maoheng Zhang (Nanjing Normal University, China)
- O5-26 LONG TERM MONITORING OF RADIOCESIUM IN SOYBEAN FIELD, LAKE
KASUMIGAURA BASIN
Peiran Li (Collage of Agriculture, Ibaraki University, Japan)
- O5-27 THE DISTRIBUTION OF ANTIBIOTIC-RESISTANT BACTERIA IN EUTROPHIC LAKE
KASUMIGAURA AND NEIGHBORING AGRICULTURAL FIELDS
Momo Yyou (Ibaraki University, Japan)

Technical Session 6: Monitoring Based on Scientific Knowledge

This session focuses on lake and river water quality and ecosystem monitoring techniques, discussing new knowledge-based techniques and the supporting advanced technologies and analytical practices utilized.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 303

October 16

9:00-10:20 Section 1 “Environmental Monitoring”

Chair: Keigo Nakamura (River Restoration Team, Water Environment Research Group, PUBLIC WORKS RESEARCH INSTITUTE)

- O6-1 WEB APPLICATION FOR EXAMINING HYDROCLIMATE INFORMATION OF GLOBAL
LAKE BASINS: CGLB USING A LATEST WORLD LAKE DATABASE
Tosiyuki Nakaegawa (Meteorological Research Institute, Japan)
- O6-2 ENVIRONMETRIC TECHNIQUES FOR SPATIO-TEMPORAL HYDROCHEMICAL
CHARACTERIZATION AND POLLUTION SOURCE IDENTIFICATION OF THE DAL
LAKE, KASHMIR HIMALAYA, INDIA
Shakil Romshoo (University of Kashmir, India)
- O6-3 USING MULTIMETRIC BENTHIC MACROINVERTEBRATE INDEX FOR THE
ASSESSMENT OF RIVER HEALTH IN THAILAND
Chotiut Techakijvej (Environmental Science Program, Faculty of Science, Chiang
Mai University, Chiang Mai, Thailand)

Chair: Hiroaki Tanaka (Research Center for Environment Quality Management, Graduate School of Engineering, Kyoto University)

Atsushi Tanaka (National Institute for Environmental Studies, Japan)

Shunichi Matsumoto (Ibaraki Kasumigaura Environmental Science Center, Japan)

Eiji Masunaga (Center for Water Environment Studies, Ibaraki University, Japan)

Chair: Hiroaki Tao (National Institute of Advanced Industrial Science and Technology (AIST))

Tetsuya Nakazato (National Institute of Advanced Industrial Science and Technology, Japan)

Hiroaki Furumai (The University of Tokyo, Japan)

Kazuo Tsutsui (Hitachi, Ltd., Japan)

Dalin Jiang (Graduate School of Life and Environmental Sciences, University of Tsukuba, China)

Chair: Bunkei Matsushita (Faculty of Life and Environmental Sciences, University of Tsukuba)

Hiroshi Murakami (Japan Aerospace Exploration Agency, Japan)

Jk Garg (University School of Environment Management, GGS Indraprastha University, India)

Yoshinori Numata (Geospatial Information Authority of Japan, Ministry of Land, Infrastructure, Transport and Tourism, Japan)

Rossi Hamzah (Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki / Indonesian National Institute of Aeronautics and Space, Jakarta, Indonesia)

October 18

9:00-10:20 Section 5 “Monitoring of Human Impacts”

Chair: Keigo Nakamura (River Restoration Team, Water Environment Research Group, PUBLIC WORKS RESEARCH INSTITUTE)

O6-15 MONITORING RADIO-CESIUM CONTAMINATION OF MOUNTAIN STREAM FISH AND ESTIMATING ¹³⁷CS ACCUMULATION RATES OF THE FISH BY MARK-RECAPTURE EXPERIMENTS IN THE EVACUATION INSTRUCTION AREAS, FUKUSHIMA PREF

Mika Tarui (Center for Water Environment Studies, Ibaraki University, Japan)

O6-16 EVALUATION OF ANTHROPOGENIC IMPACTS ON RESERVOIR WATER QUALITY: A CASE STUDY IN A RESERVOIR CATCHMENT IN SOUTHERN TAIWAN

Wan-Ru Chen (Department of Environmental Engineering, National Cheng Kung University, Tainan, Taiwan)

O6-17 INVESTIGATION OF THE SOURCE OF E.COLI IN THE SOUTHERN PART OF LAKE BIWA

Masaru Ihara (Kyoto University, Japan)

O6-18 ESTIMATION WITH TIME SPREAD OF DISSOLVED OXYGEN DEFICIENCY IN AQUATIC ENVIRONMENTS BASED ON DISSOLVED METHANE AND NITROUS OXIDE MEASUREMENTS

Yuzuru Kimochi (Center for Environmental Science in Saitama, Japan)

10:40-12:00 Section 6 “Monitoring of Emerging Pollutants”

Chair: Hiroaki Tao (National Institute of Advanced Industrial Science and Technology (AIST))

O6-19 SOURCE ESTIMATION OF VETERINARY DRUGS IN YODO RIVER WATERSHED, JAPAN

Seiya Hanamoto (Research Center for Environmental Quality Management, Graduate School of Engineering, Kyoto University, Japan)

O6-20 IMPACTS OF SEDIMENT SUPPLY FROM A DAM RESERVOIR ON HEAVY METALS CONCENTRATIONS IN DOWNSTREAM RIVER WATER

Yuji Suzuki (Public Works Research Institute, Japan)

TS6-2 **INTEGRATED DATA, MODELS AND NETWORKS PROVIDE OPPORTUNITIES TO ADVANCE LAKE SCIENCE AND PREDICTIONS**

Invited Lecture

David Hamilton (Australian Rivers Institute, Griffith University, Australia)

14:00-15:20 Section 7 “Data Analysis and Modeling”

Chair: Ichiro Embutsu (Hitachi, Ltd.)

O6-21 RECENT PROGRESS OF AN ADVANCED ECO-HYDROLOGIC AND BIOGEOCHEMICAL COUPLING MODEL IN TERRESTRIAL-AQUATIC CONTINUUM

Tadanobu Nakayama (National Institute for Environmental Studies, Japan)

O6-22 IMPACT OF CLIMATE CHANGE ON CHANGES IN RIVER WATER TEMPERATURE SIMULATED WITH SIPHER MODEL IN TAKASAKI RIVER BASIN, CHIBA, JAPAN

Rajendra Khanal (Department of Civil and Environmental Engineering, Tokyo Institute of Technology / Research Center for Water Environment Technology, the University of Tokyo, Nepal)

O6-23 ASSESSMENT OF STREAM FLOW USING SOIL AND WATER ASSESSMENT TOOL (SWAT) IN LOKTAK LAKE CATCHMENT

Ritesh Sikka (Water Management, Wetlands International South Asia, India)

- O6-24 DEVELOPING A MODEL FOR ESTIMATING SECCHI DISK DEPTH USING LANDSAT TM AND ETM+ IN INDONESIAN LAKES
Fajar Setiawan (Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki / Research Centre for Limnology, Indonesian Institute of Sciences (LIPI), Bogor, West Java, Indonesia)
- 15:40-17:00 Section 8 “Dynamics of Plankton and Dissolved Organic Matter”
Chair: Shin-Ichi Nakano (Center for Ecological Research, Kyoto University)
- O6-25 RELATIONSHIP BETWEEN WATER QUALITY AND PHYTOPLANKTON SUCCESSION IN LAKE BIWA ANALYZED BASED ON THE PEG MODEL
Shohei Ikeda (Shiga Prefecture, Japan)
- O6-26 VIRAL HOT SPOT IN LAKE BIWA, JAPAN
Shang Shen (Kyoto University, Japan)
- O6-27 COMPARISONS BETWEEN THE CHARACTERISTICS OF NATURAL ORGANIC MATTERS IN UPSTREAM INFLOWING RIVERS AND DISCHARGING SOURCES OF A DRINKING WATER RESERVOIR WITH OR WITHOUT THE TRANSBASIN DIVERSION
Chih-Hua Chang (Department of Environmental Engineering, National Cheng Kung University, Taiwan)
- O6-28 COOPERATION FOR STUDY NON-BIODEGRADABLE ORGANIC MATTER IN THE LAKE BIWA-YODO RIVER WATERSHED
Keiko Wada (Institute of Water Environmental Research, Lake Biwa-Yodo River Water Quality Preservation Organization, Japan)

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services

This session discusses various countermeasures and technology to harness ecosystem services sustainably in the future. They include structural and non-structural measures such as effluent regulation, domestic wastewater control, control of wastes from agriculture and livestock, runoff quality control, technologies for water purification and wastewater treatment, in-lake restoration technology, and economic incentive measures.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 406

October 16

9:00-10:20 Section 1 “Monitoring and Restoration of Lake Water Environment”

Chair: Hiroaki Furumai (The University of Tokyo)

TS7-1 RESTORATION OF LOCH LEVEN: SUSTAINING ECOSYSTEM SERVICES

Invited Lecture

Brian D'arcy (Independent environmental consultant, & Partner C&D Associates LLP Co-founder consulting gateway, United Kingdom)

O7-1 THE WATER QUALITY OF LAKE KASUMIGAURA AS WATER SOURCE
Maki Asami (Ibaraki Prefectural Public Enterprise Bureau, Japan)

O7-2 DEMONSTRATION FACILITY FOR PURIFICATION OF LAKE KASUMIGAURA ADOPTING FLOCCULATION AND MAGNETIC SEPARATION SYSTEM
Hideyuki Watanabe (Hitachi, Ltd., Japan)

10:40-12:00 Section 2 “Ecosystem Service”

Chair: Hitoshi Tanaka (Center for Environmental Science in Saitama)

- O7-3 VALUE-CHAIN ANALYSIS - AN ASSESSMENT APPROACH TO ESTIMATE LAKE NASSER FISHERIES PERFORMANCE
Ahmed Mohamed Nasr-Allah (WorldFish, Egypt)
- O7-4 CONSERVATION FOR LAKE ECOSYSTEM THROUGH SUSTAINABLE UTILIZATION OF AQUATIC WEEDS
Syuhei Ban (University of Shiga Prefecture, Japan)
- O7-5 ASSESSMENT OF THE FRESH WATER ECOSYSTEM SERVICES OF RESERVOIRS/ HPP DAMS IN THE KURA-ARAS RIVER BASIN
Rovshan K Abbasov (Environmental Research Centre, Khazar University, Azerbaijan)
- O7-6 CLIMATE CHANGE IMPACT ASSESSMENT ON ECOSYSTEM SERVICES OF WEST LAKE, HANOI CAPITAL AND SUGGETION A SYSTEM OF MITIGATION AND ADAPTATION MEASURES
Mai Huong Doan (Department of Ecology, Faculty of Biology, VNU Hanoi University of Science, Viet Nam)

14:00-15:20 Section 3 “Ecotoxicity”

Chair: Haruna Watanabe (Center for Health and Environmental Risk Research, National Institute for Environmental Studies)

- O7-7 WHICH OF ZEBRAFISH OR JAPANESE MEDAKA IS SUITABLE FOR THE WET TEST FOR THE EVALUATION OF SEWAGE EFFLUENT?
Satomi Mizukami Murata (Public Works Research Institute, Japan)
- O7-8 EFFECTS OF SEDIMENT AND WATER QUALITY ON ANTIOXIDANT RESPONSE OF BRACKISH BIVALVE CORBICULA JAPONICA
Preeti Pokhrel (Major in Social Infrastructure System Science, Ibaraki University, Nepal)
- O7-9 THE EFFECTS OF NATURAL AND ANTHROPOGENIC WATER QUALITY FACTORS ON SCOPE FOR GROWTH OF BRACKISH WATER BIVALVE *CORBICULA JAPONICA*
Sayaka Mashiko (Ibaraki University / IDEA Consultants, Inc., Japan)
- O7-10 SEDIMENTATION TREATMENT OF BLUE-GREEN ALGAE BY EXTRACT FROM STEELMAKING SLAG
Yutaro Natsuaki (Graduate School of Sustainability Science, Tottori University, Japan)

15:40-17:00 Section 4 “Water Treatment”

Chair: Kazuhiro Komatsu (National Institute for Environmental Studies)

- O7-11 DEMONSTRATION EXPERIMENT OF NEW WATER TREATMENT SYSTEM BY TAKING LAKE KASUMIGAURA WATER(I)
- EXAMINATION OF CHARACTERISTICS OF ADVANCED OXIDATION PROCESS AND ITS PERFORMANCE INDICATORS -
Shunsuke Takaya (Ibaraki Public Enterprise Bureau, Japan)
- O7-12 DEMONSTRATION EXPERIMENT OF NEW WATER TREATMENT SYSTEM BY TAKING LAKE KASUMIGAURA WATER(II)
-EXAMINATION OF CHARACTERISTICS OF MAGNETIC ION EXCHANGE RESIN-
Masahiko Shiba (Ibaraki Public Enterprise Bureau, Japan)
- O7-13 DEVELOPMENT OF THE ADVANCED ON-LINE UF DEFFERENTIAL PRESSURE PREDICTION SYSTEM
Kazuki Hagawa (Toray Industries, Inc. Water Treatment Technical Dept., Japan)

- 07-14 PROCESS, ORGANIZATIONAL, AND OPERATIONAL DEVELOPMENTS IN PUTATAN WATER TREATMENT PLANT 1 FROM 2015 TO 2017
Aaron S. Cornista (Maynilad Water Services, Inc., Philippines)

October 18

9:00-10:20 Section 5 "Conservation and Pollution Control"

Chair: Ikuro Kasuga (The University of Tokyo)

TS7-2 A PERSPECTIVE ON WATER ENVIRONMENT MANAGEMENT IN JAPANESE LAKES
Invited Lecture

Mitsumasa Okada (The Open University of Japan, Japan)

- 07-15 CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF FROM THE NAINITAL LAKE CATCHMENT IN THE HIMALAYAN REGION OF INDIA
Sumant Kumar (NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE, India)

- 07-16 FIELD EXPERIMENTS ON RUNOFF REDUCTION USING TERRESTRIAL ALGA AS TOPSOIL NUTRIENT ABSORBER
Katsunori Aizawa (Institute for Clean Earth, Japan)

10:40-12:00 Section 6 "Wastewater Treatment"

Chair: Masafumi Fujita (Department of Civil, Architectural and Environmental Engineering, Graduate School of Science and Engineering, Ibaraki University)

- 07-17 FULL-SCALE DEMONSTRATION OF NITRIFICATION CONTROL FOR ENERGY SAVING WITH SUFFICIENT WATER QUALITY
Yoshinori Nishida (Hitachi, Ltd., Japan)

- 07-18 EXAMINATION OF THE AERATION PROCESS TO IMPROVE NITROGEN REMOVAL DURING SEWAGE TREATMENT
Masashi Soda (Ibaraki Prefectural Regional Sewerage Office, Japan)

- 07-19 REALIZATION OF PARTIAL NITRITATION FOR MAINSTREAM DEAMMONIFICATION
Shoko Miyamae (Hitachi, Ltd., Japan)

- 07-20 SIMULTANEOUS REMOVAL OF NITROGEN AND PRIORITY PHTHALATES FROM MUNICIPAL WASTEWATER FOR MANAGEMENT OF FRESH WATER SOURCES
Khalid Muzamil Gani (Indian Institute of Technology Roorkee, India)

14:00-15:20 Section 7 "Wastewater Treatment/Aquatic Plant"

Chair: Jun Nishihiro (Toho University)

- 07-21 COMPARISON OF EFFLUENTS CHARACTERISTICS FROM FULL-SCALE WASTEWATER TREATMENT PLANTS IN THAILAND, USA, AND JAPAN BEFORE DISCHARGING TO LAKES

Pongsak Lek Noophan (Department of Environmental Engineering, Faculty of Engineering, Kasetsart University, Bangkok, Thailand)

- 07-22 DEVELOPMENT OF DESIGN METHOD FOR LOCALIZATION OF JAPANESE JOHKASOU TO EU AREA

Masahiro Furuichi (Johkasou System Association / Houstec Inc. / Tohoku University, Japan)

- 07-23 PROBLEM ALLIGATOR WEED MANEGEMENT PRACTICES IN INBA-NUMA LAKE FOR FLOOD DESASTER RISK REDUCTION AND SUSTAINABLE EFFORT TO CONTROL INVASIVE WATER PLANTS

Masami Hasegawa (Toho univ, Japan)

- 07-24 FUNCTIONALITY AND UTILIZATION OF NATIVE CHESTNUTS IN INBA-NUMA
Masaki Ikeoka (REFINE HOLDINGS CO.,LTD., Japan)

15:40-17:00 Section 8 “Sanitation and Appropriate Technology”

Chair: Dai Shimazaki (National Institute of Public Health)

- 07-25 HYGIENE AND SANITATION OF PEOPLE LIVING ON AND AROUND TONLE SAP LAKE: COMPARISON OF WATER BASED, WATER-LAND BASED AND LAND BASED ZONES
Sokneang In (Institute of Technology of Cambodia, Cambodia)
- 07-26 SUCCESSFUL RESULTS OF THE ECOLOGICAL SANITATION APPROACH TOWARD HARMONIOUS COEXISTENCE OF THE PEOPLE AND LAKE MALAWI, AFRICA
Aubrey Rozario Chimwaza (Nippon International Cooperation for Community Development / Cowater Sogema, Inc, Malawi)
- 07-27 THE CHALLENGE FOR LAKE VICTORIA PROTECTION BY THE ECOLOGICAL SANITATION APPROACH IN KENYA
Joan Maureen Opuba (Nippon International Cooperation for Community Development / Freelance consultant, Water/Environment Management, Kenya)
- 07-28 AN ENERGY-SAVING AEROBIC PURIFICATION OF WASTEWATER AND DRINKING WATER BY THE SLANTED-SOIL-CHAMBER METHOD
Masato Kiji (YONDEN CONSULTANTS CO., INC., Japan)

Technical Session 8: Citizens' Activities and Environmental Education

This session focuses on citizen activities and involvement, and environmental education, exploring region-based practices to ensure better lakes and basins for future generations.

Date & Time October 16 (Tue.) 9:00-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 201B

October 16

9:00-10:20 Section 1 “Participation and Collaboration 1”

Chairs: Shinji Ide (School of Environmental Sciences, the University of Shiga Prefecture)

Munetsugu Kawashima (Shiga University)

- 08-1 WELCOME TO SHISHITUKA SATOYAMA WOODLAND. LET'S DO IT TOGETHER
Hiromi Oikawa (certified nonprofit organization for nature conservation and history transmission of shishitsuka satoyama, Japan)
- 08-2 ENVIRONMENTAL EDUCATION IN SATOYAMA OF THE LAKE INBA SOURCE AREA
Hisao Suzuki (Non profit organization NPO Tomisato-no-Hotaru, Japan)
- 08-3 SUSTAIN RICH WATERSIDE LANDSCAPES FOR NEXT GENERATION
Iyoko Kanezaki (AKANOI, Japan)
- 08-4 REGIONAL EFFORTS TO PROTECT AND CREATE BEAUTIFUL AMANOHASHIDATE, ASOKAI AND ITS WATERSHED, “THE THREE MAJOR SCENERIES OF JAPAN”
Naoki Ando (Miyazu City Hall, Japan)

10:40-12:00 Section 2 “Participation and Collaboration 2”

Chairs: Munetsugu Kawashima (Shiga University)

Shinji Ide (School of Environmental Sciences, the University of Shiga Prefecture)

TS8-1 COMMUNITY PARTICIPATION IN INTEGRATED WATER RESOURCE MANAGEMENT IN NORTHERN THAILAND

Invited Lecture

Chitchol Phalaraksh (Department of Biology, Faculty of Science, Chiang Mai University / Environmental Science Research Center, Faculty of Science, Chiang Mai University, Thailand)

Chairs: Tai Harada ((NPO) Kasumigaura Academy)

O8-7	THE CHANGING ROLE OF COMMUNITY IN THE MANAGEMENT OF RESERVOIRS IN JAKARTA Gutomo Bayu Aji (Research Centre for Population, Indonesian Institute for Sciences, Indonesia)
O8-8	STAKEHOLDER PARTICIPATION FOR DETERMINING RESEARCH DIRECTION OF PHAYAO LAKE, THAILAND Santiwat Pithakpol (University of Phayao, Thailand)
O8-9	IMPLEMENTATION AND EVALUATION OF THE “TIRTA BUDAYA SITU” WATER CULTURE PROGRAM ESTABLISHED FOR URBAN LAKES WITHIN THE JAKARTA METROPOLITAN AREA Ami A. Meutia (Kyoto University / UP 45 University, Indonesia)
O8-10	THE WAYS TO INCREASE ENVIRONMENTAL AWARENESS OF THE ARAL TRAGEDY AND ITS ECOLOGY TODAY Khairulla Zhanbekov (University of KazNPU after named Abay, Kazakhstan)

Chairs: Kahoru Ogawa (Kahoru Ogawa Environmental Education Office)

O8-11	INITIATIVE BY MAHARASHTRA STATE ANGLING ASSOCIATION (MSAA) TO CONSERVE POWAI LAKE, MUMBAI, INDIA Farid Hamid Sama (MAHARASHTRA STATE ANGLING ASSOCIATION, India)
O8-12	OUR ESTIMATION AND PROPOSAL ON LAKE KASUMIGAURA RADIOACTIVE CONTAMINATION CAUSED BY FUKUSHIMA POWER PLANT INCIDENT Atsunobu Hamada (Specified Nonprofit Corporation, Japan)
O8-13	ECOLOGICAL SURVEY ON A SMALL-SIZED URBAN RIVER BY LOCAL COMPANIES AND ITS EXTENSION IN LOCAL SOCIETY Shigekazu Miyagi (Konan Kigyou Ikimono Oendan (Environmental Supporters in Konan Area), Japan)
O8-14	THE HISTORY OF THE ENVIRONMENTAL PROBLEM OF LAKE BIWA AND THE MESSAGE TO THE NEXT GENERATION Yoshiji Horino (hirose co.ltd., Japan)

October 18

9:00-10:20 Section 5 "Ecological Conservation"

Chairs: Hiromi Oikawa (Certified Non-profit Organization for Nature Conservation and History Transmission of Shishitsuka Satoyama)

Shinji Ide (School of Environmental Sciences, the University of Shiga Prefecture)

08-15 TAMURA · OKUJUKU · TOSAKI AREA NATURAL RESTORATION PROJECT

Naoto Yoshida (Kasumigaura River Office, Kanto Regional Development Bureau, MLIT, Japan)

08-16 EFFORTS OF "FISH CRADLE PADDY" BY SUHARA SESERAGI NO SATO IN YASU CITY, SHIGA PREFECTURE

Kiwa Akamatsu (Suhara-seseraginosato (Local residents organization), Japan)

08-17 THE URGENT PROBLEM OF INVASIVE ALIEN AQUATIC PLANTS IN TEGANUMA AND WHAT CIVIC GROUPS CAN DO

Hiroko Hanzawa (Association of civic groups which love beautiful Teganuma, Japan)

08-18 THE COOPERATION WITH VARIOUS ORGANIZATIONS BY UNIVERSITY STUDENTS IN REMOVAL ACTIVITY OF INVASIVE ALIEN AQUATIC WEED IN LAKE BIWA, JAPAN

Yume Tanaka (International Volunteer University Student Association, Japan)

10:40-12:00 Section 6 "Education Program and Practice 1"

Chairs: Kahoru Ogawa (Kahoru Ogawa Environmental Education Office)

Shinji Ide (School of Environmental Sciences, the University of Shiga Prefecture)

TS8-2 ESD & SDGS, BEYOND THE ENVIRONMENTAL EDUCATION

Invited Lecture

Kazuyuki Mikami (Former President of Miyagi University of Education, Japan)

08-19 COMPREHENSIVE ENVIRONMENTAL LEARNING ACTIVITIES AT EVERY LIFE STAGE IN SHIGA, THROUGH THE PERSPECTIVE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

Yoshichika Akasaki (Shiga Prefecture, Japan)

08-20 EDUCATIONAL PROGRAM OF THE CENTER FOR WATER ENVIRONMENT STUDIES, IBARAKI UNIVERSITY

Yuji Kuwahara (Center for Water Environment Studies, Japan)

14:00-15:20 Section 7 "Education Program and Practice 2"

Chairs: Munetsugu Kawashima (Shiga University)

Tai Harada ((NPO) Kasumigaura Academy)

08-21 "WETLANDS AND YOUTH" SESSIONS AT THE ASIA WETLAND SYMPOSIUM AND ITS ACHIEVEMENTS

Takuma Satoh (Youth Ramsar Japan, Japan)

08-22 EXPANDING THE POSSIBILITY OF LAKE ENVIRONMENTAL EDUCATION BY USING VIRTUAL REALITY TECHNOLOGY

Eisuke Hayaoka (Hokkaido University, Japan)

08-23 "INBA-NUMA LEARNING" -HUNAHO SATOYAMA IS THE HOMETOWN OF LAKE INBA-NUMA-

Hisako Ogura (The Committee for Lake Inba-numa Watershed Management, Japan)

08-24 COMMISSIONED PROJECTS OF KASUMIGAURA CITIZENS' ASSOCIATION

Kaoru Yoshida (Kasumigaura Citizens' Association, Japan)

15:40-17:00 Section 8 “Education Program and Practice 3”

Chairs: Tai Harada ((NPO) Kasumigaura Academy)

Munetsugu Kawashima (Shiga University)

- O8-25 LIAISON COUNCIL ACTIVITIES OF SAKURA RIVER EXPEDITION
Kazuo Okubo (Kasumigaura Citizens' Association, Japan)
- O8-26 EFFECTS OF CHILDREN'S AWARENESS AND UNDERSTANDING OF NATURAL ENVIRONMENT BY ENVIRONMENTAL LEARNING ACTIVITIES FOR RIVERS CONDUCTED AT LOCAL ENVIRONMENTAL INSTITUTE
Shunichi Miwa (Ibaraki Kasumigaura Environmental Science Center, Japan)
- O8-27 INFLUENCE OF REGIONAL DIALOGUE ON AWARENESS OF RIVER BASIN RESIDENTS ON WATER ENVIRONMENT
Satoshi Suzuki (Fukushima Prefectural Centre for Environmental Creation, Japan)
- O8-28 THE ENVIRONMENTAL PROBLEMS OF LAKE KASUMIGAURA BROUGHT UP ON THE NHK TELEVISION PROGRAM
Shimako Kawamura (University of Tsukuba, Japan)

Technical Session 9: Integrated Lake Basin Management (ILBM)

This session discusses various ways for lake the basin stakeholders to collectively pursue Integrated Lake Basin Management (ILBM) through incremental, sustained and long-term improvement of basin governance, prospectively resulting in successful conservation and improvement of basin ecosystem services.

Date & Time October 16 (Tue.) 9:20-17:00, October 18 (Thur.) 9:00-17:00

Venue Tsukuba International Congress Center, Conference room 304

October 16

9:40-10:20 Section 1 “Lake-River-Coastal Basin Governance”

Chair: Masahisa Nakamura (International Lake Environment Committee (ILEC))

TS9-1 **IMPLEMENT BETTER-GOVERNANCE FOR THE INTEGRATED RIVER BASIN MANAGEMENT IN LAKE BIWA-YODO RIVER**

Invited Lecture

Norio Nakatsuka (The Organizing Committee of the World Masters Games 2021 Kansai, Japan)

10:40-12:00 Section 2 “ILBM and Lake Basin Governance 1”

Chair: Kentaro Taki (University of Shiga Prefecture)

TS9-2 **INTEGRATED LAKE BASIN MANAGEMENT (ILBM) AS AN INTEGRAL PART OF TRANSFORMING THE MALAYSIAN WATER SECTOR**

Invited Lecture

Salmah Zakaria (ACADEMY OF SCIENCES MALAYSIA (ASM), Malaysia)

- O9-1 GOVERNANCE GAPS AND PROSPECTS IN THE STA. ROSA WATERSHED OF LAGUNA LAKE, PHILIPPINES
Ria Adoracion Lambino (Research Institute for Humanity and Nature, Philippines)
- O9-2 INTEGRATED LAKE BASIN MANAGEMENT IN MALAYSIA - A DECADE OF EVOLUTION
Zati Sharip (National Hydraulic Research Institute of Malaysia, Malaysia)

14:00-15:20 Section 3 “ILBM and Lake Basin Governance 2”

Chair: Naoko Hirayama (Faculty of Environmental Sciences, the University of Shiga Prefecture)

- O9-3 CONSERVATION OF WETLANDS IN BHUTAN
Sonam Choden (Ramsar Focal Point, Royal Government of Bhutan, Bhutan)
- O9-4 CONSTRUCTION OF PARTNERSHIPS TO IMPROVE INTEGRATED MANAGEMENT OF LAKE CHAPALA BASIN, MEXICO
Alejandro Juárez Aguilar (Institute Corazon de la Tierra, Mexico)
- O9-5 PEACE & GOVERNANCE: CHALLENGES FOR SUSTAINABLE DEVELOPMENT OF LAKE LANAO, SOUTHERN PHILIPPINES
Sukarno Tanggol (Mindanao State University-Iligan Institute of Technology, Philippines)
- O9-6 MEXICAN WATERSHED NETWORK, A PROPOSAL TO WORK ON THE INTEGRAL MANAGEMENT OF LAKES IN MEXICO
Eduardo Rios Patron (Red Mexicana de Cuencas, Mexico)

15:40-17:00 Section 4 “ILBM Institutions and Their Typology 1”

Chair: Keiko Wada (Institute of Lake Biwa-Yodo River Water Environmental Research, Lake Biwa-Yodo River Water Quality Preservation Organization)

- O9-7 IMPACTS OF RECENT ENVIRONMENTAL CHANGES ON THE LIVELIHOODS OF FISHING COMMUNITIES IN THE TONLE SAP LAKE (TSL)
Pham Ngoc-Bao (Institute for Global Environmental Strategies (IGES), Japan)
- O9-8 ROLE OF LOCAL AUTHORITY IN INTEGRATED LAKE BASIN MANAGEMENT: EXPERIENCES FROM MALAYSIA
Minhaz Farid Ahmed (Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia (UKM), Bangladesh)
- O9-9 RIVER/LAKE CHIEF, A NEW CONCEPT PROPOSED BY CHINA TO IMPROVE WATER ENVIRONMENT
Haijun Wang (State Key Laboratory of Freshwater Ecology and Biotechnology, Institute of Hydrobiology, the Chinese Academy of Sciences, China)
- O9-10 NATIONAL SECTOR PROGRAMME (NSP) FOR WATER RESOURCES MANAGEMENT 2018-2030 IN ALBANIA, AS A PLATFORM TOWARDS 2030 SDG 6
Arduen Karagjozi (Technical Secretariat of National Water Council, Albania)

October 18

9:00-10:20 Section 5 “Ecosystem Service Assessment 1”

Chair: Keiko Wada (Institute of Lake Biwa-Yodo River Water Environmental Research Lake Biwa-Yodo River Water Quality Preservation Organization)

- O9-11 FACTORS AFFECTING STAKEHOLDERS EVALUATION ABOUT LAKE BIWA BASIN
Naoko Hirayama (The University of Shiga Prefecture, Japan)
- O9-12 PERCEPTIONS, ATTITUDES AND PREFERENCES FOR WETLAND ECOSYSTEM SERVICES: A CASE STUDY OF TAMPARA, ODISHA
Ritesh Kumar (Wetlands International South Asia, India)
- O9-13 ECOSYSTEM HEALTH CARD FOR LAGUNA DE BAY AND ITS TRIBUTARIES
Jocelyn Gazmen Sta. Ana (Environmental Laboratory and Research Division, Laguna Lake Development Authority, Philippines)

- 09-14 MAIN OUTCOMES, RESULTS AND LESSONS LEARNT FROM THE INTERNATIONAL WORKSHOP ON INTEGRATED LAKE BASINS MANAGEMENT (WITH SPECIAL EMPHASISON ON THE IMPORTANCE OF ESSVA[1] IN THE ILBM FRAMEWORK IN WEST AFRICA). [1] *ECOSYSTEM SERVICES SHARED VALUE ASSESSMENT*
Salif Elhadji Diop (Academy of Sciences of Senegal, Senegal)

10:40-12:00 Section 6 “Ecosystem Service Assessment 2”

Chair: Victor Shiholo Muhandiki (International Lake Environment Committee (ILEC))

- 09-15 ECOSYSTEM SERVICES VALUATION FOR URBAN LAKE AND WETLAND - A CASE OF PUTRAJAYA
Normaliza Noordin (Perbadanan Putrajaya, Malaysia)
- 09-16 'ENHANCED HYDROLOGICAL CONNECTIVITY' FACILITATED IMPROVEMENT OF LULC STATUS IN THE CATCHMENT AREA OF LAKE CHILIKA: A CASE STUDY FROM PARTNER'S FOR RESILIENCE PROJECT, INDIA
Sasawata Kumar Mohapatra (SPANDAN (NETCOAST), India)
- 09-17 PARTICIPATORY BASIN MANAGEMENT AND BIODIVERSITY CONSERVATION IN ANSUPA LAKE, INDIA
Durga Prasad Dash (PALLISHREE, India)
- 09-18 VULNERABILITY AND ECOSYSTEM SERVICES ASSESSMENT OF MUDA LAKE BASIN UNDER THE IMPACT OF CHANGING CLIMATE
Zati Sharip (National Hydraulic Research Institute of Malaysia, Malaysia)

14:00-15:20 Section 7 “Climate Change Impact”

Chair: Naoko Hirayama (Faculty of Environmental Sciences, the University of Shiga Prefecture)

- 09-19 GOVERNMENT DISASTER RESPONSE TO FLOOD AND UTILIZATION OF REMOTE SENSING TO RIVER OBSERVATION ; AN INVESTIGATION IN THE ASIA PACIFIC REGION
Takahiro Kikuchi (University of Ibaraki, Graduate School of Science and Engineering, Division of Social Infrastructure System Science Doctor course, Japan)
- 09-20 MANAGEMENT OF A TROPICAL FRESHWATER LAKE UNDER A CHANGING CLIMATE AND ENVIRONMENT
Shadananan Nair Krishnapillai (Centre for Earth Research and Environment Management, India)
- 09-21 STUDY ON THE RESPONCE OF WATER QUALITY OF NEARBY LAKES BY THE CHANGE OF ATMOSPHERIC CONDITIONS
Tetuya Nakamura (River Front Research Institute, Japan)
- 09-22 WATER AVAILABILITY AND DEMAND UNDER CLIMATE CHANGE AND POPULATION GROWTH, IN LAKE GUIERS, SENEGAL
Djiby Sambou (University Assane Seck of Ziguinchor, Senegal)

15:40-17:00 Section 8 “ILBM Institutions and Typology 2”

Chair: Masahisa Nakamura (International Lake Environment Committee (ILEC))

- 09-23 LAKE BASIN ENVIRONMENT OF THE LAKE CLUSTER POKHARA VALLEY (RAMSAR SITE), NEPAL
Shailendra Kumar Pokharel (Conservation Development Foundation (CODEFUND), Nepal)
- 09-24 STAKEHOLDER'S ACCOUNT OF THE SOCIAL AND ENVIRONMENTAL CHALLENGES IN THE LAKE VICTORIA BASIN
Karljin Van Den Broek (University of Heidelberg, Netherlands)

- O9-25 LIMNOLOGICAL STUDIES OF LONAR LAKE, BULDHANA DISTRICT,
MAHARASHTRA, INDIA
Aman Vikas Ghutke (Department of Environmental Science S.B.E.S. College of
Science, Aurangabad (M.S), India)
- O9-26 PROPERTY REGIME CHANGE AND LAKE DEGRADATION: AN INSTITUTIONAL
ANALYSIS OF LAKE RAWAPENING IN INDONESIA
Evi Irawan (Watershed Management Technology Center, Indonesia)

◆ Technical Session (Poster)

Date & Time

< Free Browsing >
October 16 (Tue.) 9:00-17:00
October 18 (Thur.) 9:00-15:00

< Core Time >

[Presentation ID - odd number] October 16 (Tue.) 13:00-14:00
[Presentation ID - even number] October 18 (Thur.) 13:00-14:00

Venue

Conference room 101, 102, Tsukuba International Congress Center

Technical Session 1: Biodiversity and Biological Resources

- P1-1 PLANKTON COMMUNITY STRUCTURE IN SAGULING DAM
Alya Fatina Diandari (Institute Teknologi Bandung, Indonesia)
- P1-2 MICROBIAL COMPETITION FOR ACETATE: AN IMPORTANT FACTOR TO MITIGATE METHANE EMISSION FROM SASA-INVADDED WETLAND SOILS
Tomo Aoyagi (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
- P1-3 A NEW HYPOTHESIS FOR THE DECLINING CAUSE OF THE JAPANESE EEL
Atsunobu Hamada (Specified NPO Corporation, Japan)
- P1-4 DEVELOPMENT OF A METHOD FOR LOTUS VARIETY IDENTIFICATION AND VARIATION IN POLYPHENOL CONTENTS
Rio Takama (Col. Agr. Ibaraki U., Japan)
- P1-5 WATER QUALITY AND FISHERIES OF THE BUI DAM IN GHANA: FIVE YEARS AFTER IMPOUNDMENT
Ruby Asmah (CSIR Water Research Institute, Ghana)
- P1-6 COMPARISON OF ENVIRONMENTAL CONDITION USING BIOLOGICAL INDICATORS IN YATSU TIDAL FLAT LOCATING IN TOKYO INNER BAY
Mana Ubukata (Dept of Life and Environmental Sciences, Chiba Institute of Technology, Japan)
- P1-7 DIVERSITY MODELS OF PLANKTON IN GOLD COAST ORNAMENTAL LAKE, PANTAI INDAH KAPUK, NORTH JAKARTA
Sigid Hariyadi (Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Bogor Agricultural University, Indonesia)
- P1-8 ANTIFUNGAL ACTIVITY OF ACTINOMYCETES ISOLATED FROM SURFACE SEDIMENTS OF LAKE LANA O AGAINST *CANDIDA ALBICANS* AND *ASPERGILLUS NIGER*
Naima Ramos Sirad (Faculty, Philippines)
- P1-9 ENVIRONMENTAL IMPACT RISK ASSESSMENT OF ALIEN SPECIES USING MICROCOSM SYSTEM
Tatsuya Shimizu (Dept. of Life and Environmental Sciences, Chiba Institute of Technology, Japan)
- P1-10 BIOLOGICAL EVALUATION METHOD FOR WATER QUALITY ENVIRONMENT IN THE KUJI RIVER BASIN USING AMPHIPODA (CRUSTACEA)
Wataru Suzuki (Okukuji Research Group for Biological Diversity, Japan)
- P1-11 DISTRIBUTION OF PHYTOPLANKTON AND WATER QUALITY IN CHIANG MAI MOAT, THAILAND
Metee Khonfu (Department of Biology, Chiang Mai Rajabhat University, Thailand)
- P1-12 BIODIVERSITY ASSESSMENT IN AND AROUND THE MUSEUM LAKE IN GOVT. BOTANICAL GARDEN AND MUSEUM, THIRUVANANTHAPURAM INDIA
Anila P Ajayan (UNEMPLOYED, India)

- P1-13 DIVERSITY OF FISHES IN LAGUNA DE CAGAYAN LAKE, PHILIPPINES: STATUS AND CONSERVATION NEEDS
Wilma Solomon Urmeneta (Cagayan State University, College of Fisheries and Marine Science- Aparri Campus, Philippines)
- P1-14 BIRD ABUNDANCE IN THE RICE FIELDS OF CHOR-LAE COMMUNITY, MAE RIM DISTRICT, CHIANG MAI PROVINCE IN THAILAND
Nattida Supahan (Department of Biology / Centre of Excellence of Biodiversity Research and Implementation for Community, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai, Thailand)
- P1-15 FEED STUDIES ON INGESTIVE BEHAVIOR AND FOOD OF THE JUVENILE MUSSEL (BIVALVIA: *UNIONIDAE*) AFTER FALLING OFF IN LAKE ANENUMA, AOMORI PREFECTURE
Akira Someya (University of Kitasato, Japan)
- P1-16 BIODIVERSITY EVALUATION USING NATURE INDEX TOOL IN CHILIKA LAKE, ODISHA, INDIA - A CASE STUDY
Chelladurai Thomson Jacob (Consultant (Biodiversity Policy), Centre for Biodiversity Policy and Law, National Biodiversity Authority, India)
- P1-17 TERRESTRIAL AND FRESHWATER MOLLUSKS ON THE UNIVERSITY OF TSUKUBA CAMPUS
Ikuyo Saeki (University of Tsukuba, Japan)
- P1-18 ISOLATION, SCREENING, AND IDENTIFICATION OF POTENTIAL ANTIBIOTIC-PRODUCING FUNGI FROM SURFACE SEDIMENTS OF LAKE LANA O, PHILIPPINES
Beverly Bermejo Amparado (Mindanao State University, Philippines)
- P1-19 EVALUATION OF RIVER ENVIRONMENT BY BIOLOGICAL INDICATORS IN BOSO PENINSULA
Tsuyoshi Doyama (Dept. of Life and Environmental Sciences, Chiba Institute of Technology, Japan)
- P1-20 THE DIVERSITY OF PHYTOPLANKTON IN SOME CHECK DAMS OF CHIANG MAI PROVINCE
Anudech Junthong (Department of Biology Chiang Mai Rajabhat University, Thailand)
- P1-21 A BRIEF INTRODUCTION OF BIODIVERSITY IN DONGTING LAKE
Nan Yang (ASEM Water Resources Research and Development Center, China)
- P1-22 DO WINTER-FLOODED PADDIES SERVE AS OVERWINTERING SITES FOR AQUATIC ANIMAL COMMUNITIES?
Kota Tawa (River Restoration Team, Water Environment Research Group, Public Works Research Institute, Japan)
- P1-23 ESTIMATION OF ECOLOGICAL CARRYING CAPACITY OF TILAPIA (*OREOCHROMIS NILOTICUS*) CAGE CULTURE IN LAKE VOLTA USING PHOSPHORUS MASS BALANCE
Anthony Yaw Karikari (CSIR WATER RESEARCH INSTITUTE, Ghana)
- P1-24 HABITAT EVALUATION PROCEDURE OF *UNIONIDAE* IN ANENUMA-LAKE, AOMORI PREFECTURE, JAPAN
Ryohei Iwatsubo (University of Kitasato, Japan)
- P1-25 RELATIONSHIP BETWEEN APPEARANCE OF WILD MAMMALS AND LAND COVER IN URBAN AND PERI-URBAN ENVIRONMENTS: ANALYSIS OF ROAD KILL DATA IN TSUKUBA
Shoma Jingu (Graduate School of Life and Environmental Sciences, Division of Appropriate Technology and Sciences for Sustainable Development, University of Tsukuba, Japan)
- P1-26 AQUATIC ECOSYSTEM SERVICE PERCEPTIONAL PROFILE ASSESSMENT: FOCUS ON REGULATING SERVICES AND IMPACT TO HUMAN HEALTH IN BALOI LAKE, BALOI, LANA O DEL NORTE (PHILIPPINES)
Misael M. Sanguila (Mindanao State University, Philippines)

- P1-27 COMPARISON OF FOOD HABITS, BODY SHAPE AND GROWTH ON NATIVE PISCIVOROUS FISH, *OPSARIICHTHYS UNCIROSTRIS UNCIROSTRIS*, IN LAKE BIWA BETWEEN 1960S AND 2010S
Hiroshi Tsunoda (Center for Environmental Science in Saitama, Japan)
- P1-28 ENVIRONMENTAL CONDITION, DISTRIBUTION, AND STRUCTURE OF AQUATIC PLANT COMMUNITIES OF THE RIVERS AND IRRIGATION CHANNELS AROUND THE LAKE SUWA, NAGANO PREFECTURE, CENTRAL JAPAN
Kumiko Okubo (Shinshu University, Japan)
- P1-29 FISHING GROUNDS AND CLOSED FISHING AREAS OF LAKE BARINGO, KENYA
Jones Rama Muli (Kenya Marine and Fisheries Research Institute, Baringo Field Station, Kenya)
- P1-30 FISH EMIGRATION FROM SMALL LAKES AND RELATED FACTORS
Yoshito Mitsuo (Center for Toki & Ecological Restoration, Institute for Research Promotion, Niigata University, Japan)
- P1-31 NON-NATIVE CHANNEL CATFISH MODIFY SWIMMING MODE AND BUOYANCY BASED ON FLOW CONDITIONS
Makoto Yoshida (National Institute for Environmental Studies, Lake Biwa Branch Office, Japan)
- P1-32 EFFECTS OF UPSTREAM RESERVOIR REGULATION ON THE INTRA-ANNUAL DISTRIBUTION OF BENTHIC INVERTEBRATES IN A LARGE FLOODPLAIN LAKE (DONGTING LAKE, CHINA)
Can Xu (State Key Laboratory of Water Resources and Hydropower Engineering Science, Wuhan University, China)
- P1-33 ALIEN PLANT *LUDWIGIA GRANDIFLORA* SUBSP. *GRANDIFLORA* IS EXTERMINATED IN THE EMBRYONIC STAGE
Kenta Izuhara (Ministry of Land, Infrastructure, Transport and Tourism, Kanto Regional Development Bureau, Kasumigaura River Office, Investigation Division, Japan)
- P1-34 THE PRESENT GROWTH AFTER THE REMOVAL OF *LUDWIGIA GRANDIFLORA* SUBSP. *GRANDIFLORA* (ONAGRACEAE) IN LAKE KASUMIGAURA, IBARAKI PREFECTURE, JAPAN
Ayano Ito (Ibaraki Nature Museum, Japan)
- P1-35 THE INVASIVE ALIEN SPECIES OF FRESHWATER CRAYFISH: ECOLOGICAL AND ECONOMICAL IMPACTS
Ali Mashar (Bogor Agricultural University (IPB), Indonesia)
- P1-36 DEVELOPMENT OF MANAGEMENT METHOD FOR THE INVASIVE WATER PRIMROSE (*LUDWIGIA GRANDIFLORA*) IN LAKE BIWA
Akihiro Kondo (Hiyoshi Corporation, Japan)
- P1-37 CHANGES OF FISH FAUNA IN RESPECT TO ENVIRONMENTAL CHANGES OF LAKE KASUMIGAURA AND ITS CONSERVATION
Soichi Yamane (Biodiversity Center, Natural Environment Division, Department of Residential and Environmental Affairs, Ibaraki Prefecture, Japan)
- P1-38 HABITAT STATUS OF *PROCAMBARUS CLARKII* IN A EUTROPHICATION-REGULATING PONDAGE
Ryo Tsunokake (Iwate Prefectural University, Japan)
- P1-39 DAMAGE CAUSED BY *LIMNOPERNA FORTUNEI* AT THE WATER PURIFICATION PLANT AND COUNTERMEASURES
Kumiko Toyooka (Ibaraki Prefectural Public Enterprise Bureau, Japan)
- P1-40 PRESENT STATE AND CONTROL OF SOME SPECIFIED INVASIVE ORGANISMS (PLANTS) ESTABLISHED IN AND AROUND LAKE KASUMIGAURA
Haruo Uchiyama (Biodiversity Center, Natural Environment Division, Department of Residential and Environmental Affairs, Ibaraki Prefecture / Conservator of Suigo-Tsukuba Quasi-National Park, Japan)

- P1-41 ECOSYSTEM-LEVEL ASSESSMENT OF LIVING MICROBIAL PESTICIDES USING AQUATIC MICROCOSM SYSTEM
Kazuhiro Murakami (Dept. of Life Science, Chiba Institute of Technology, Japan)
- P1-42 USE OF MACROINVERTEBRATE AS THE WATER QUALITY BIO-INDICATOR IN WANG RIVER AND CREATING A LEARNING GUIDE FOR ELEMENTARY STUDENTS
Wanlapa Konginta (Chiang Mai Rajabhat University, Thailand)
- P1-43 SATOHAMA : HARMONIOUS COEXISTENCE OF HUMANS AND CREATURE
Hidehiro Kimura (Kasumigaura Citizens' Association, Japan)
- P1-44 LIVING WITH THE ORIENTAL WHITE STORKS ~THE CHALLENGE FOR TOYOOKA~
Yuto Oitsu (Toyooka Municipal Government, Division for coexistence with the Oriental White Stork, Japan)
- P1-45 CONCEPT OF EQUITY IN THE CONTEXT OF PROTECTED AREA MANAGEMENT AND ITS FUTURE ISSUES
Kunihiko Kobayashi (Research Institute for Humanity and Nature, Japan)
- P1-46 ASSESSMENTS OF HEAVY METALS ÉLÉMENTS(NICKEL,ZINC,COPPER) POLLUTION IN AHÉMÉ LAKE IN BÉNIN WEST AFRICA
Ishola Nurudeen Adenle (Laboratoire de recherche sur des écosystèmes environnementaux ,Facultés des sciences et Techniques(FAST) de Université d'Abomey Calavi Bénin, Benin)

Technical Session 2: Sustainable Use of Freshwater Resources

- P2-1 PRACTICAL ISSUES OF CLIMATE CHANGE ON WATER QUALITY PREDICTION FOR WATER QUALITY AND ECOSYSTEM IMPACT ASSESSMENT IN LAKE AND WATER QUALITY EVALUATION OF ADAPTATION MEASURES
Tadasu Yamada (Water Environment Division Environmental Management Bureau Ministry of the Environment, Japan)
- P2-2 DYNAMICS OF ANTHROPOGENIC ORGANIC MATTER BISPHENOL A ASSOCIATED WITH SALT LEVELS IN THE ESTUARY
Miyuki Yamane (University of Soka Graduate School of Engineering Snvironmental Engineering for Symbiosis, Japan)
- P2-3 HISTORICAL CHANGE FROM FRESH WATER TO BRACKISH CONDITIONS IN LAKE SUIGETSU INFERRED FROM STEROL TRACERS
Masatoshi Nakakuni (Soka University, Japan)
- P2-4 MONITORING INVESTIGATION OF REDUCTION IN SEDIMENT INTRUSION IN KUSHIRO WETLAND
Taro Yamamoto (River Center of Hokkaido, Japan)
- P2-5 UNDERSTANDING OF GROUNDWATER POLLUTION ACTUAL CONDITION SURVEY RESULTS AND MEASURES TO PREVENT GROUNDWATER CONTAMINATION
Shingo Kuki (Office for Groundwater and Ground Environment Environmental Management Bureau Ministry of the Environment., Japan)
- P2-6 REGIME SHIFTS OF YANGTZE SUBTROPICAL SHALLOW LAKES
Haijun Wang (The State Key Laboratory of Freshwater Ecology and Biotechnology, Institute of Hydrobiology, Chinese Academy of Sciences, China)
- P2-7 PUBLIC PARTICIPATION IN SOCIAL AUDITING AND ECO-POLITICS OF WATER QUALITY AND ECOLOGICAL HEALTH OF THE FRESHWATER LAKE UJJANI,
Anil Sampatrao Patil (Maharashtra Vikas Kendra, Pune, India)

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

- P3-1 WATER QUALITY ASSESMENT IN THE DIYAWANNA LAKE, SRI LANKA
Ranjana Udaya Kumara Piyadasa (Department of Environmental Technology, Sri Lanka)
- P3-2 ABUNDANCE AND DISTRIBUTION OF CILIATED PROTOZOANS IN MARANTAO'S LITTORAL AND PELAGIC ZONES OF LAKE LANA O, PHILIPPINES
Fema Mag-Aso Abamo (Biology Department, Mindanao State University / MSRTC, MSU, Marawi City, Philippines)
- P3-3 RELATIVE IMPORTANCE OF PHYSICAL AND BIOLOGICAL FACTORS REGULATING TINTINNID POPULATIONS: A FIELD STUDY WITH FREQUENT SAMPLINGS IN SENDAI BAY, JAPAN
Takehiro Kazama (National Institute for Environmental Studies, Japan)
- P3-4 ASSIMILATION OF CYANOBACTERIA BY A FRESHWATER BIVALVE, *UNIO DOUGLASIAE*: ANALYSIS OF STABLE C AND N ISOTOPE RATIOS AND FATTY ACID COMPOSITIONS
Kotaro Sugawara (Akita Prefectural University, Japan)
- P3-5 THE RELATIONSHIP OF THE MICROBIOTA INCLUDING ALGAL BLOOM FORMING CYANOBACTERIA AND THE ENVIRONMENTAL FACTORS IN LAKE HACHIRO
Kunihiro Okano (Akita Prefectural University, Japan)
- P3-6 DEVELOPMENT OF ONE-INDIVIDUAL DNA SEQUENCING METHOD OF PREDATION METAZOAN FOR TOXIC CYANOBACTERIA
Thakong Watcharapong (Graduate school of Engineering, Nagasaki University, Thailand)
- P3-7 REGULATION OF DIATOMS ON SILICON DYNAMICS IN THE XIANGXI RIVER
Wujuan Mi (Institute of Hydrobiology, Chinese Academy of Sciences, China)
- P3-8 SEASONAL CHANGE RELATED TO VERTICALLY DISTRIBUTED DISSOLVED OXYGEN IN EUTROPHIC SHALLOW WATER
Morio Tsuji (Iwate prefectural university, Japan)
- P3-9 A REVIEW ON THE PELAGIC ECOLOGY OF LAKE LANA O, MINDANA O IS., PHILIPPINES
Ephrime Bicoy Metillo (Department of Biological Sciences, Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines)
- P3-10 RELATIONSHIP BETWEEN THE WHITE TURBIDITY AND THE FISH PRODUCTION IN LAKE KASUMIGAURA
Jun Iwasaki (Professional Engineer (Fisheries : Aquatic Environment), Japan)
- P3-11 SENSITIVITY LEVEL OF PHYTOPLANKTON TOWARDS NUTRIENTS AND ZOOPLANKTON IN EBONY LAKE, PIK RESIDENCE, NORTH JAKARTA
Niken Tunjung Murti Pratiwi (Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Bogor Agricultural University, Indonesia)
- P3-12 TROPHIC AND ECOLOGICAL STATES OF GARDEN HOUSE ORNAMENTAL LAKE, PANTAI INDAH KAPUK, NORTH JAKARTA
Inna Puspa (Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Bogor Agricultural University, Indonesia)
- P3-13 CURRENT AND RECENT CHANGES IN HALOCLINE AND CIRCULATING DEPTHS IN LAKE OGAWARA
Kota Harada (Universtiy of Kitasato, Japan)
- P3-14 RELATIONSHIP BETWEEN TN/TP RATIO AND PRINCIPAL COMPONENT SCORES ON AN IRRIGATION POND COVERED WITH FLOATING-LEAVED PLANT
Masaaki Kondo (Graduate School of Bioresources, Mie University, Japan)

- P3-15 POTENTIAL VEGETATION FOR NITROGEN REMOVAL IN LAKE RIPARIAN AND CATCHMENT AREAS
Susi Abdiyani (Watershed Management Technology Center, Indonesia)
- P3-16 THE INCONVENIENCE OF TRADITIONAL FISHING PRACTICE ON AQUATIC ECOSYSTEM OF LAKE NOKOUE IN REPUBLIC OF BENIN (WEST AFRICA)
Bernadin Elegbede Manou (National Water Institute- University of Abomey Calavi, Benin)
- P3-17 ASSESSMENT OF THE EFFECT ON WATER QUALITY IN TSUCHIURA PORT BY THE OPERATION OF ITS DIRECT PURIFICATION FACILITY
Ryuji Shimura (Ibaraki Kasumigaura Environmental Science Center, Japan)
- P3-18 WATER QUALITY CHANGE IN LAKE HAMANA BETWEEN 1995 AND 2017
Atsushi Kubo (Shizuoka University, Japan)
- P3-19 SUTAINABLE APPROACH TO CONSERVE AN ANCIENT WATER SUPPLY SYSTEM: SALIM ALI LAKE AT AURANGABAD, (MS), INDIA
Kshamadevi Shankarrao Khobragade (DEPT OF ENVIRONMENTAL SCIENCE, S B E S COLLEGE OF SCIENCE, India)
- P3-20 NOTES ON THE RESULTS OF A WATER QUALITY SURVEY FOR LAKE USHIKUNUMA, IBARAKI PREFECTURE, JAPAN
Yoshiko Tominaga (Kasumigaura Environmental Science Center, Japan)
- P3-21 ICHTIOINDICATIVE ASSESSMENT OF WATER QUALITY IN URBAN LAKES (ON THE EXAMPLE OF KAZAN, RUSSIA)
Nail Gosmanovich Nazarov (Kazan Federal University, Russia)
- P3-22 CONIFEROUS FORESTS AND LAKES: THE IMPACT OF PINE POLLEN ON WATER QUALITY
Piotr Klimaszyk (Department of Water Protection. A. Mickiewicz University, Poland)
- P3-23 CONTRIBUTION OF NITROGEN DEPOSITION TO TAIHU LAKE
Xi Chen (School of Geography Science, Nanjing Normal University, China)
- P3-24 SUSTAINABLE UTILIZATION OF A CRATER LAKE BY RIPARIAN COMMUNITIES: THE QUALITY OF THE WATERS OF LAKE BOSOMTWE IN THE ASHANTI REGION OF GHANA
Mark Osa Akrong (Council for Scientific and Industrial Research - Water Research Institute (CSIR-WRI), Ghana)
- P3-25 STUDY ON BEHAVIOR OF INORGANIC NITROGEN IN LAKE NAKAUMI
Toshikuni Kato (Shimane Prefectural Institute of Public Health and Environmental Science, Japan)
- P3-26 NUTRIENT DYNAMICS AND TROPHIC STATE OF LAKE TEMPE IN SOUTH SULAWESI, INDONESIA
Yustiawati Yustiawati (Research Center for Limnology, Indonesian Institute of Sciences, Indonesia)
- P3-27 STUDY ON THE GROWTH OF PERDIMUM NUMBONATUM VAR. INAEQUALE AND SCENEDESMUS BIJUGA WITH DIFFERENT ORGANIC PHOSPHORUS SOURCES
Yuping Su (Environmental Science and Engineering College, Fujian Normal University / Fujian Key Laboratory of Pollution Control and Resource Recycling, China)
- P3-28 INFLUENCE OF NUTRIENT COMPOSITION ON PHYTOPLANKTON COMMUNITY IN LAKE SUWA
Masato Yokouchi (Graduate school, Shinshu University, Nagano Prefecture, Japan)
- P3-29 WATER QUALITY ASSESSMENT AND TROPHIC STATUS DETERMINATION OF LAKE LANA O, MINDANAO ISLAND, PHILIPPINES
Carmelita Garcia Hansel (Mindanao State University, Marawi City, Lanao del Sur, Philippines)

- P3-30 WATER QUALITY CHANGES AND EFFECTS OF POLLUTION IN KISUMU BAY WATERS OF LAKE VICTORIA
Rolin Nzomo Mwiva (Environment. Lake Basin Development Authority, Kenya)
- P3-31 INFLOW TO THE RIVER AND CHANGES OF ORGANIC MATTER THAT CONSTITUTING C3 AND C4 PLANT
Shuhei Segawa (Soka Graduate School of Engineering, Environmental Engineering for Symbiosis Major, Japan)
- P3-32 LESSON LEARNED FROM MANAGEMENT OF WEST LAKE (HO TAY) IN HANOI CAPITAL OF VIETNAM AFTER A HALF CENTURY
Ly Thi Ha Bui (Central Institute for Natural Resources and Environmental Studies (CRES), Vietnam National University, Hanoi, Viet Nam)
- P3-33 CLIMATE CHANGE IMPACT ON WATER TEMPERATURE AND DO IN LAKE BIWA AND ITS MECHANISM
Yosuke Tanabe (University of Osaka, Japan)
- P3-34 RECONSTRUCTION OF PALEO VEGETATION RECORDED FROM THE LAKE BAIKAL SEDIMENT
Keiko Takehara (University of SOKA, Japan)
- P3-35 INFLUENCE OF CLIMATE CHANGE ON WATER QUALITY IN LAKE KASUMIGAURA
Shunsuke Komuro (Ibaraki Kasumigaura Environmental Science Center, Japan)
- P3-36 A STUDY ON RELATIONSHIP BETWEEN ATMOSPHERIC TEMPERATURE AND LAKE WATER TEMPERATURE
Akira Watanuki (Chuo University, Japan)
- P3-37 ASSESSMENT OF HEAVY METALS CONTAMINATION OF BOTTOM SEDIMENT IN TONLE SAP LAKE, CAMBODIA
Boreborey Ty (Institute of Technology of Cambodia, Cambodia)
- P3-38 EVALUATION OF HYPOXIC WATER MASS OCCURRENCE MECHANISMS IN ASOKAI: FOCUSING ON SEDIMENT OXYGEN DEMAND AND FACTOR
Hayato Mori (Graduate School of Science and Engineering, University of Ritsumeikan, Japan)
- P3-39 VARIABILITY IN BOTTOM-WATER DISSOLVED OXYGEN CONCENTRATION IN LAKE INAWASHIRO
Saori Onuma (Fukushima Prefectural Centre for Environmental Creation, Japan)
- P3-40 SURVEY ON MEASURES FOR THE CONSERVATION OF LAKE WATER QUALITY RELATING TO BOTTOM LAYER DISSOLVED OXYGEN AND COASTAL TRANSPARENCY
Tadasu Yamada (Water Environment Division, Ministry of the Environment, Japan)
- P3-41 FORMATION AND DECOMPOSITION OF POLYMERIC SILICATE IN PORE WATER
Jayeong Park (Graduate School of Human and Environmental Studies, Kyoto university, Japan)
- P3-42 ASSESING THE HEAVY METAL CONTENT OF GOLDEN APPLE SNAIL (*POMACEA CANALICULATA*), WATER AND SEDIMENTS AFTER FISH KILLS INCIDENT IN LAKE MAINIT, NORTHEASTERN MINDANAO, PHILIPPINES
Rainer Percy Sularte (Caraga State University, Graduate School, Philippines)
- P3-43 ANALYSES OF MICROBIAL CONSORTIA IN WATER AND SEDIMENT SAMPLES OF TONLE SAP LAKE
Kazuhiko Miyana (Tokyo Institute of Technology, Japan)
- P3-44 HORIZONTAL DISTRIBUTION OF SEDIMENT AND CHARACTERISTIC OF NUTRIENTS DIFFUSION IN LAKE KOYAMA-IKE
Masaki Okamoto (Tottori Prefectural Institute of Public Health and Environmental Science., Japan)

- P3-45 INHIBITION OF ANAEROBIC WATER LAYER FORMATION USING A MULTIFUNCTIONAL AERATOR INSTALLED IN HIYOSHI DAM
Yuji Iwamatsu (Japan Water Agency, Japan)
- P3-46 EVALUATION OF A NEW SIMPLE METHOD FOR MEASURING SEDIMENT OXYGEN DEMAND IN LAKE BIWA
Koichi Shimotori (National Institute for Environmental Studies, Japan)
- P3-47 BIOTRANSFORMATION OF ARSENIC SPECIES BY PHYTOPLANKTON IN FRESHWATER
Rimana Islam Papry (Graduate School of Natural Science and Technology, Division of Material Chemistry, Kanazawa University, Bangladesh)
- P3-48 APPLICABILITY OF IODINE ACTIVATED CARBON FOR MAINTENANCE OF LAKES AND MARSHES IN GOOD ENVIRONMENTAL CONDITION
Katsuyoshi Tatenuma (Kaken Inc., Japan)
- P3-49 ESTABLISHING A TOTAL MAXIMUM DAILY LOADS (TMDL) PLAN FOR EUTROPHIC RESERVOIR: TAKING SHIMEN RESERVOIR AS AN EXAMPLE
Chia-Chun Ho (National Taipei University of Technology, Taiwan)

Technical Session 4: Lakeside History and Culture

- P4-1 REHABILITATION OF "FLOWING NET WITH RICE CAKE HUNT" AND "WIDE RECTANGLE NET HUNT" TO WATERFOWL
Kensuke Yamazaki (consultant (environment, tourism, folklore), Japan)
- P4-2 OBSERVATION OF SPAWNING SEASON OF FRESHWATER PRAWN, *MACROBRACHIUM NIPPONENSE* AND A STUDY OF CULTURAL VALUES OF LAKE USHIKUNUMA
Takashi Nemoto (Ibaraki prefectural government office, Japan)
- P4-3 LIVELIHOODS IN THE HIMALAYAN WETLAND A CASE STUDY IN HIGHEST LAKE IN THE HIMALAYA
Bishnu Bahadur Bhandari (Nepal Wetlands Society, Nepal)
- P4-4 WHY DO LAKES LURE PEOPLES' MINDS ?
Atsushi Numazawa (Kasumigaura Citizens' Association, Japan)
- P4-5 REGIONAL CREATION PROJECT UTILIZING SEAPLANE
Takumi Kato (Nihon University, Japan)

Technical Session 5: Regional Activities and Matter Cycles

- P5-1 EFFECT OF DENITRIFYING BACTERIA ON RICE PLANT GROWTH-PROMOTION UNDER LOW-NITROGEN INPUT CONDITION: INVESTIGATION OF RICE PLANT GROWTH AND MOLECULAR ANALYSIS OF ROOT-ASSOCIATED SOIL BACTERIAL COMMUNITY
Midori Sakoda (College of Agriculture, Ibaraki University, Japan)
- P5-2 THE ANALYSIS BETWEEN THE SEDIMENTATION CHARACTERISTICS OF SHALLOW LAKE AND HUMAN ACTIVITIES IN THE MIDDLE REACHES OF YANGTZE RIVER
Yanhua Wang (School of Geography Science, Nanjing Normal University / Jiangsu Center for Collaborative Innovation in Geographical Information Resource Development and Application, China)
- P5-3 LIFE CYCLE ASSESSMENT OF RICE CULTIVATION TECHNOLOGY: ASSESSING INFLUENCE OF NON-PUDDLING AND SPARSE TRANSPLANTING
Motoko Shimura (NARO Western Region Agricultural Research Center, Japan)
- P5-4 AN *N*-ALKANE $\delta^{13}\text{C}$ FOR ASSESSING SOURCES OF TERRESTRIAL ORGANIC MATTER IN LACUSTRINE SEDIMENTS IN CHINA
Yanhua Wang (Nanjing Normal University, China)

- P5-5 THE STUDY OF RUNOFF LOADS FROM LOTUS PADDY FIELDS AFTER INSTALLATION OF AGRICULTURAL INFRASTRUCTURE
Wataru Iio (Ibaraki Kasumigaura Environmental Science Center, Japan)
- P5-6 RECENT CHANGES IN THE VERTICAL DISTRIBUTION OF NITROGEN AND PHOSPHOROUS IN A BRACKISH LAKE OGAWARAKO OF NORTHEASTERN JAPAN
Kazunori Shizuka (Inland Water Fisheries Research Institute, Aomori Prefectural Industrial Technology Research Center / Graduate School of Veterinary Sciences, Kitasato University, Japan)
- P5-7 EVALUATION OF AVAILABLE WATER RESOURCES AND NITROGEN RUNOFF IN NORTHEAST THAILAND
Yuki Jikeya (Ibaraki University, Japan, Japan)
- P5-8 RELATIONSHIP BETWEEN NUTRIENTS AND ALGAL GROWTH POTENTIAL OF STORMWATER IN THE INBANUMA BASIN
Tomokazu Kitamura (Public Works Research Institute, Japan)
- P5-9 BIOCHEMICAL POTENTIAL OF FRESHWATER, BRACKISH, AND SEA SEDIMENTS FOR REMOVING ANTIMONY FROM WATER ENVIRONMENT
Satoshi Soda (Ritsumeikan University, Japan)
- P5-10 ELEMENTAL COMPOSITION AND MICROBIAL COMMUNITY STRUCTURE ANALYSIS OF SURFACE SOILS AFFECTED BY THE KANTO-TOHOKU HEAVY RAINFALL DISASTER IN SEPTEMBER 2015
Tomoyasu Nishizawa (College of Agriculture, Ibaraki University, Japan)
- P5-12 SCREENING OF SYMBIOTIC FUNGI ASSOCIATED WITH BEECH AND APPLICATION FOR TRIAL PLANTING OF BEECH SEEDLINGS IN THE ABANDONED CROPLAND AROUND KOMADO-SHITSUGEN MOOR
Yusuke Takashima (Ibaraki University, College of Agriculture, Japan)

Technical Session 6: Monitoring Based on Scientific Knowledge

- P6-1 MONITORING AND EVALUATION OF THE WATER QUALITY OF TAAL LAKE, TALISAY, BATANGAS, PHILIPPINES
Felipe Buno Martinez (De La Salle University Dasmarias, Philippines)
- P6-2 ESTIMATE OF THE SALT WATER BALANCE AT THE GATE-CONTROLLED WEIR OF THE ABASHIRI RIVER
Fuyuki Tazaki (Hokkai-suiko Consultant Corp., Japan)
- P6-3 ESTIMATE OF THE FLOW VOLUME BY USING H-ADCP AT THE GATE-CONTROLLED WEIR OF THE ABASHIRI RIVER
Kazuya Inoue (Hokkai-suiko Consultant Corp., Japan)
- P6-4 ANALYSIS OF STATISTICAL METHODS FOR WATER-LEVEL FORECASTS OF NIGER INNER DELTA IN MALI
Barry Kassambara (MIE UNIVERSITY, Mali)
- P6-5 ANALYSIS AND INVESTIGATION OF RIVERBED VARIATION MECHANISM FOR EFFICIENT AND EFFECTIVE LAKE MANAGEMENT
Hideyuki Ikeda (Ministry of Land, Infrastructure, Transport and Tourism Tohoku Regional Bureau Takasegawa River Office, Japan)
- P6-6 PARTICLE SIZE DISTRIBUTION OF SEDIMENT IN FISH NESTS AND POOL IN AGRICULTURAL DRAINAGE CANAL
Shota Takagi (College of Agriculture, Ibaraki University, Japan)
- P6-7 ASSESSMENT OF HARMFUL CYANOBACTERIA GROWTH POTENTIAL BASED ON HYDRODYNAMIC MODELLING
Myeongsub Byeon (Han-River Environment Research Center, National Institute of Environmental Research (NIER), Korea)

- P6-8 SIMPLE AND RELIABLE BIOLOGICAL MONITORING OF LAKES FOR SUSTAINABLE SERVICES
Shobha Jagannath (Department of Studies in Botany, University of Mysore, India)
- P6-9 ECOLOGICAL HEALTH ASSESSMENT OF LOEI RIVER AND TRIBUTARIES BY USING AQUATIC INSECTS UNDER RIVER CONTINUUM CONCEPT
Thanayaporn Katesuja (Environmental Science Programe, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand)
- P6-10 SPATIO-TEMPORAL EVALUATION OF FLOOD IMPACTS ON WETLAND VEGETATION
Shara Grace Cosmod Astillero (Hokkaido University, Philippines)
- P6-11 RELEASE OF THE SATELLITE-BASED LAKE AND RESERVOIR TEMPERATURE DATABASE IN JAPAN (SATLARTD-J) VERSION 3
Yudai Mizoguchi (Ibaraki University, Japan)
- P6-12 IMPROVEMENT OF HYDROLOGICAL AND HYDRAULIC MODEL BY APPLYING SATELLITE-BASED PRECIPITATION IN THE TONLE SAP LAKE
Ichiro Yoneda (Faculty of agriculture, Yamagata University, Japan)
- P6-13 SPATIOTEMPORAL VARIABILITY OF CHLOROPHYLL-A CONCENTRATION IN LAKE MALAWI USING MERIS DATA
Augusto Nunes Brito Vundo (Graduate School of Life and Environmental Sciences, University of Tsukuba / Pedagogical University, Mozambique)
- P6-14 UNMANNED VEHICLE ON WATER QUALITY MONITORING IN RESERVOIR
Jr-Lin Lin (Department of Environmental Engineering, Chung Yuan Christian University, Taiwan)
- P6-15 CONTROL OF ILLEGAL HUNTING BY USING DRONES IN ANZALI WETLAND IN IRAN
Hitoshi Watanabe (Nippon Koei Co.,Ltd., Japan)
- P6-16 LCMSMS DETERMINATION OF ANTIBIOTICS AND HORMONES AND ITS APPLICATION IN LAKE WATER MONITORING
Maria Pythias Baradero Espino (University of the Philippines, Philippines)

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services

- P7-1 EFFECTS OF ORGANIC POLLUTANT FROM ANAEROBIC DIGESTATE ON SOLUBILITY OF POLY-BROMINATED DIPHENYLETHER IN AQUATIC ENVIRONMENT
Chen Shi (National Institute for Environmental Studies / University of Tsukuba, China)
- P7-2 THE INFLUENCE OF TOTAL SOLIDS CONCENTRATION ON THE PERFORMANCE OF ANAEROBIC DIGESTION OF FOOD WASTE
Yong Hu (National Institute for Environmental Studies, Japan)
- P7-3 VERIFICATION ON AOSD CONTROL SYSTEM AS ELECTRIC POWER REDUCTION SAVING ENERGY /ADVANCED WASTEWATER TREATMENT TECHNOLOGY IN VIETNAM AND SPREAD FOR ENVIRONMENTAL RESTORATION IN ASIAN AREAS
Yuhei Inamori (Foundation for Advancement of International Science, Japan)
- P7-4 NUTRIENT REMOVAL PERFORMANCE IN A CONSTRUCTED WETLAND USING MODIFIED BIOCHAR AS A BED-FILTER
Kaoru Abe (Institute for Agro-Environmental Sciences, NARO, Japan)
- P7-5 CHARACTERISTICS OF NITROGEN AND PHOSPHORUS REMOVAL TYPE ONSITE WASTEWATER TREATMENT SYSTEM AND APPLICABILITY TO FOREIGN COUNTRIES
Yosuke Tabata (Fuji Clean Co., Ltd., Japan)

- P7-6 NUTRIENT REMOVAL FROM DOMESTIC WASTEWATER BY JOHKASOU IN WATERSHED OF LAKES
Yoko Fujimura (Graduate School of Engineering, Chiba University, Japan)
- P7-7 SUMMERY OF ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM AND PERFORMANCE EVALUATION OF WASTEWATER TREATMENT TECHNOLOGY
Naohiro Kishida (Saitama-ken Environmental Analysis and Research Association, Japan)
- P7-8 REMOVAL OF LINEAR ALKYL BENZENE SULFONATE BY VERTICAL FLOW CONSTRUCTED WETLANDS
Daisuke Inoue (Osaka University, Japan)
- P7-9 ELUCIDATION OF THE INTRODUCTION EFFECT OF OIL-WATER SEPARATION EQUIPMENT BY GRAY WATER FOOTPRINT
Toshihiko Otsuka (Saitama-ken environmental analysis & research association, Japan)
- P7-10 EFFICIENT AND SUSTAINABLE REMOVAL OF PHENOLIC ENDOCRINE-DISRUPTING CHEMICALS BY COMMON REED AND DEGRADING BACTERIAL ASSOCIATION
Tadashi Toyama (University of Yamanashi, Japan)
- P7-11 POLLUTION OF WATER BODIES AND MITIGATION IN SRI LANKA
Indra Vijitha Warnakula Ediriweera (National Water Supply and Drainage Board, Sri Lanka)
- P7-12 IMPROVEMENT OF BOTTOM SEDIMENT QUALITY BY MAGNESIUM-BASED MATERIAL AND ENVIRONMENTAL APPLICATION
Shunya Tanaka (Ube Material Industries, Ltd., Japan)
- P7-13 SURVEY OF ANAMMOX BIOFILM IN ACTIVATED SLUDGE TREATMENT FACILITIES IN SWINE FARMS
Miyoko Waki (National Agriculture and Food Research Organization, Institute of Livestock and Grassland Science, Japan)
- P7-14 ENHANCEMENT IN ENERGY CONSERVATION BY USING LIQUID-FILM-FORMING APPARATUS IN SHRIMP CULTIVATION POND
Passaworn Warunyuwong (Division of Environmental Engineering, Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Thailand)
- P7-15 INFLUENCE OF POOR OXYGENATION OF THE BOTTOM LAYER OF LAKES ON REGROWTH OF ALGAE CELLS IN SEDIMENT
Hitoshi Tanaka (Center for Environmental Science in Saitama, Japan)
- P7-16 ECONOMICS OF NON-POINT SOURCE POLLUTION CONTROL: AN OVERVIEW AND A PROPOSAL FOR A RELATIVE EVALUATION APPROACH
Eiji Sawada (Kyushu Sangyo University, Japan)
- P7-17 DEVELOPMENT OF PRACTICAL EQUIPMENT ON PHOSPHORUS REDUCTION OF EUTROPHIC RIVER BY IRON ION ELUTION METHOD
Naozo Fukuda (Fukken Co., Ltd. Consulting Engineers, Japan)
- P7-18 CONTAMINATION OF RIVER ECOSYSTEMS WITH HARMFUL ORGANIC CHEMICALS RELEASED FROM RECYCLING OF ELECTRONIC-WASTE IN NORTHERN VIETNAM
Hidenori Matsukami (National Institute for Environmental Studies, Japan)
- P7-19 EMPIRICAL STUDIES OF SEWAGE REPRODUCTION PROCESSING SYSTEM
Tomoya Nakamura (Nishihara Environment Co., Ltd, Japan)
- P7-20 REMOVAL OF CHEMICALS IN SEWAGE TREATMENT PLANTS-IN THE CASE OF 1,4-DIOXAN-
Takayuki Fujita (Ibaraki Prefectural Kashima Sewage Office, Japan)

- P7-21 EVALUATION OF PARTITIONING POTENTIAL AND BIOACCUMULATION OF SEVEN SCCPS IN LAKE ECOSYSTEM
Zhenyi Zhang (National Institute for Environmental Studies, Japan)
- P7-22 LAKE MANAGEMENT IN PRESENT AREA FOR ALL DEVELOPMENT
Natoi Allah Ringar (PHILOSOPHY OF ENVIRONMENTAL EDUCATION AND SPECIALIST IN PROTECTION AND DEVELOPMENT OF LAKE CHAD, Chad)
- P7-23 AN ATTEMPT FOR IMPROVEMENT OF WATER QUALITY AND CULTIVATION OF PLANKTON BY CONDUCTING POLYMERS
Hiromasa Goto (Department of Materials Science Faculty of Pure and Applied Sciences, University of Tsukuba, Japan)
- P7-24 NITROGEN REMOVAL UNDER LOW DISSOLVED OXYGEN CONDITIONS IN ACTIVATED SLUDGE TREATMENT OF SWINE WASTEWATER -RESULTS OF PILOT PLANT OPERATION-
Jouraku Asaoka (Ibaraki Prefectural Livestock Research center, Japan)
- P7-25 SEWERAGE OF SHIGA PREFECTURE
Hiroshi Matsumoto (Shiga Prefecture, Japan)
- P7-26 VERIFICATION EXPERIMENT FOR THE IMPROVEMENT OF AN ANOXIC BRACKISH LAKE
Koki Sugihara (Civil engineering research institute for cold region, Japan)
- P7-27 DECOMPOSITION OF REFRACTORY CHEMICALS AND CHANGES IN THE NUMBER OF BACTERIA BY DISCHARGE REACTOR OF IMMERSION TYPE
Yuji Matsubayashi (University of Ibaraki, Japan)

Technical Session 8: Citizens' Activities and Environmental Education

- P8-1 CITIZENS' MOVEMENT TO TACKLE WATER ENVIRONMENT PROBLEMS: 34 YEARS OF NATIONAL SUIGO-SUITO CONFERENCE
Toshihisa Asano (Hiroshima University, Japan)
- P8-2 CLEANING ACTIVITIES IN LAKE KASUMIGAURA AND FUTURE PROSPECTS
Kenji Saito (NPO WATERSIDE BASIS SOCIETY, Japan)
- P8-3 AN URBAN POND RESTORATION AND PRESERVATION PROJECT BY COLLABORATION OF LOCAL COMMUNITIES
Fumi Sugita (Chiba University of Commerce, Japan)
- P8-4 BIRDS SIGHTSEEING AS A STRATEGY FOR RAISING AWARENESS OF LAKE CHAPALA ECOLOGICAL IMPORTANCE
Alejandro Juárez Aguilar (Institute Corazón de la Tierra, Mexico)
- P8-5 SUSTAINABLE NEIGHBORHOOD DESIGN IN WATERSIDE AREA :A CASE STUDY ON THE CONSTRUCTION OF FLOODWATER RETAINING BASIN
Kazuki Nomura (Graduate School of Education, The University of Tokyo, Japan)
- P8-6 TRANSFORMATION OF CONSCIOUSNESS OF ENVIRONMENTAL PRESERVATION AFTER ENVIRONMENTAL LEARNING AT KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER
Naoto Hosoda (Ibaraki Kasumigaura Environmental Science Center, Japan)
- P8-7 HUMAN RACE IS PREPARING ITS OWN END! IS IT POSSIBLE TO SLOW DOWN?
Ozgur Aydinca (General Directorate of State Hydraulic Works (DSI), Turkey)
- P8-8 EXPERIMENTAL MATERIAL WITH WATER ROCKET FOR ENVIRONMENTAL DATA SAMPLING IN MIDDLE OF LAKE
Masaki Yokoyama (Workshop for Space and Environment Education, Japan)
- P8-9 OUTREACH USING "TOMBO POND" IN MUSEUM: EX-SITU CONSERVATION OF ENDANGERED SPECIES AND DISSEMINATION FOR NATURE CONSERVATION
Masaru Tsuchiya (Tokai High School, Japan)

- P8-10 ECOTOURISM FACILITY ASSESSMENT AND CONSERVATION PERSPECTIVES OF BOGA LAKE BY INDIGENOUS COMMUNITY
Ebtisamul Zannat Mim (University of Dhaka, Bangladesh)
- P8-11 DEVELOPMENT OF ENVIRONMENT EDUCATION PROGRAM MADE USE OF THE DIVERSITIES AND LOCATION OF FUJI FIVE LAKES
Kazuya Yoshizawa (Yamanashi Institute of Public Health and Environment, Japan)
- P8-12 WATER QUALITY RESEARCH AND WATER ENVIRONMENTAL SOUNDNESS INDEX ESTIMATION OF LAKE INBA(FY2012-FY2017)
Yuka Takagi (Dept. of Life and Environmental Sciences. Chiba Institute of Technology, Japan)
- P8-13 THE RELATIONSHIP BETWEEN SEWAGE COVERAGE RATIO AND POLLUTANT CONCENTRATION FOR LAKE KASUMIGAURA AND LAKE SUWA
Masayuki Miyauchi (Kasumigaura Citizen's Association, Japan)
- P8-14 EFFORTS FOR PURIFICATION OF WATER QUALITY IN LAKE USHIKUNUMA
Kunihiko Ogawa (Environmental Management Division, Ibaraki Prefectural Government, Japan)
- P8-16 EVOLUTION OF A HYBRID FRAMEWORK FOR ADAPTIVE WATERSHED GOVERNANCE IN A MICRO-WATERSHED SCALE LAGUNA DE BAY BASIN, PHILIPPINES
Jocelyn Fabian Siapno (Laguna Lake Development Authority, Philippines)
- P8-17 ACTIVITIES OF "KOTOKU-NUMA NATURE PRESERVATION ASSOCIATION", THE WINTERING GROUND OF THE SOUTHERNMOST OF THE WHOOPEER SWAN
Takashi Meguro (Urizura District Community Planning Committee, Japan)

Technical Session 9: Integrated Lake Basin Management (ILBM)

- P9-1 DEVELOPMENT AND THINKING OF THE INTEGRATED TREATMENT SYSTEM OF BASIN WATER ENVIRONMENT
Xiaofei Xue (Beijing Enterprises Water Group Limited, China)
- P9-2 TOWARD RAISING LOCAL RESIDENTS' AWARENESS OF LAKE KASUMIGAURA'S WATER ENVIRONMENT
Hiroaki Banba (Ministry of Land, Infrastructure, Transport and Tourism. Kanto Regional Development Bureau. Kasumigaura River Office. Environment Department of Lakes and Marshes., Japan)
- P9-3 WATER QUALITY MANAGEMENT OF DAM RESERVOIRS MANAGED BY THE MINISTRY OF LAND, INFRASTRUCTURE AND TRANSPORT
Sorin Nishimura (National Institute for Land and Infrastructure Management, Japan)
- P9-4 LAKE KASUMIGAURA PURIFICATION AREA ACTIVITIES
Isao Kamata (University of Tsukuba, Japan)
- P9-5 FUNCTIONING OF THE KARSTIC SYSTEM OF INFLUENCE OF THE BACALAR LAGOON APLIED TO THE TERRITORIAL ECOLOGICAL ORDERING
Silvana Marisa Ibarra Madrigal (Colegio de la Frontera Sur, Mexico)
- P9-6 CONSTRUCTION OF LAND USE MODEL FOR FLOOD ANALYSIS FOR LAGUNA LAKE IN THE PHILIPPINES
Akio Onishi (Yokohama City University, Japan)
- P9-7 CLIMATE RESILIENT WATER SECURITY FOR URBAN SETTLEMENTS : ROLE OF LAKES A CASE OF BENGALURU, INDIA
Jagannatha Venkataramaiah (Civil Engg Dept, Jain University, India)
- P9-8 CONTROL OF WATER HYACINTH IN THE LAGOON OF YURIRIA, GUANAJUATO MEXICO
Juan Manuel López Gutierrez (Universidad de Guanajuato, División de Ciencias de la Vida, Mexico)

(8) Conference Summary

Date & Time	October 19 (Fri.), 2018 10:00-12:00
Room	Main Convention Hall, Tsukuba International Congress Center
Agenda	

Opening		
Policy Forum		Chairperson, 17th World Lake Conference Project Promotion Committee Saburo Matsui
Lakes Session (Japan)		Vice President, International Lake Environment Committee Foundation Masahisa Nakamura
Lakes Session (World)		Director, Ibaraki Kasumigaura Environmental Science Center Takehiko Fukushima
Lake Kasumigaura Session		Director, Ibaraki Kasumigaura Environmental Science Center Takehiko Fukushima
Technical Sessions	Technical Session 1	Director, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies Hiroya Yamano
	Technical Session 2	Director, River Department, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism Kunihiko Amano
	Technical Session 3	Head, Lake Biwa Branch office, National Institute for Environmental Studies Akio Imai
	Technical Session 4	Professor Emeritus, Ryutsu Keizai University Makoto Kagawa
	Technical Session 5	Professor, Department of Regional and Comprehensive Agriculture, College of Agriculture, Ibaraki University Hisao Kuroda
	Technical Session 6	Professor, Research Center for Environmental Quality Management, Graduate School of Engineering, Kyoto University Hiroaki Tanaka
	Technical Session 7	Professor, Research Center for Water Environment Technology, Graduate School of Engineering, The University of Tokyo Hiroaki Furumai
	Technical Session 8	Director, Kahoru Ogawa Environmental Education Office Kahoru Ogawa
	Technical Session 9	Vice President, International Lake Environment Committee Foundation Masahisa Nakamura
Summary		Chairperson, 17th World Lake Conference Project Promotion Committee Saburo Matsui
Closing		

(9) Closing Ceremony

Date & Time	October 19 (Fri), 2018 13:00-14:00
Room	Main Convention Hall, Tsukuba International Congress Center
Order of Ceremony	

Opening ceremony		
Greeting from host		Governor of Ibaraki Prefecture, Chair of Executive Committee Kazuhiko Oigawa
Reading of Ibaraki Kasumigaura Declaration		Director General, Department of Residential and Environmental Affairs, Ibaraki prefectural Government Akira Saito
Greeting from host of 18th World Lake Conference		United Mexican States
Closing address		President, International Lake Environment Committee Foundation Kazuhiko Takemoto
Closing ceremony		

MEMO

(10) Student Conference

The aim is to raise the awareness of young people, who are the leaders of the next generation, about the water environment, and to encourage a sense of love for their hometown where they can be proud of the lakes and the water environment that are familiar to them.

Date & Time October 14 (Sun.) 10:00-17:00

Participation Fee Free

Schedule

Time	Contents	Venue
9:00-10:00	Registration	Entrance Hall
10:00-10:15	Opening Ceremony	Main Convention Hall
10:20-10:50	Oral Presentation	E.S. : Convention Hall 300 J.H.S. : Convention Hall 200 H.S. : Main Convention Hall
10:50-11:00	Break Time	
11:00-12:00	Oral Presentation	E.S. : Convention Hall 300 J.H.S. : Convention Hall 200 H.S. : Main Convention Hall
12:00-13:00	Lunch Break	
13:00-14:30	Poster Presentation	Conference room 101, 102
14:30-14:45	Break Time	
14:45-16:00	Discussion	E.S. : Convention Hall 300 J.H.S. : Convention Hall 200 H.S. : Main Convention Hall
16:00-16:15	Break Time	
16:15-17:00	Closing Ceremony	Main Convention Hall

◆ Oral Presentation

Oral Presentation is divided into 3 divisions: Elementary School Students, Junior High School Students and High School Students

Theme "About nature related to lakes and blessing of nature"

Time 10:20-12:00

① Elementary School Students (Convention Hall 300)

- | | | | |
|-----|---|-----|---|
| OE1 | Examine the blessings from Kitaura's water environment, find the splendor of Kitaura, and clean Kitaura !
Hokota-shi Shiratori Nishi elementary school | OE2 | Story of salmon Ranger Corps 10 years
Sakasagawa Children's Eco Club Salmon Ranger team |
| OE3 | Breeding and protection of Musashi Tmomiyo
Kumagaya Municipal Kuge Elementary School Eco-club Committee | OE4 | Kasumigaura Environment
Ukishima elementary School |
| OE5 | To Save Our Mother Lake Kasumigaura
Tamari East Elementary School | OE6 | The activities of Ramsar Biwa-Kids Ambassador
Ramsar Biwa-Kids Ambassadors |
| OE7 | To protect the environment of Lake Hinuma
Nagaoka Elementary School 4th grade | OE8 | The Connection of Our Life and Kasumigaura
Tsuchiura Municipal Kamiootsu-higashi Elementary School 4th graders |

- OE9 Water, Forests and People: Building sustainable water resource management in Northeastern Thailand
Metaneedol Elementary School, Thailand

② Junior High School Students (Convention Hall 200)

- | | | | |
|-----|--|-----|--|
| OJ1 | Komon-sama's Fireflies Revival Project
MITO EIKO JUNIOR HIGH SCHOOL
Science Club | OJ2 | Exploring Factors which Change the Water Quality of Kasumigaura
Miho Junior High School Science Club |
| OJ3 | Water environment around Toyosato junior high school and purification
Toyosato junior high school science club | OJ4 | Creating an environment of indigenous species and How to use invasive species
AOBADA elementary & middle school
smile familia |
| OJ5 | The valuable natural protection activity that I stay in an area
Ajigaura Junior high School Sawada
Sukashiyuri research team | OJ6 | How to appeal the wonderful waterside of Shiga
TANAKAMI children's Environment Club
Middle school student team |
| OJ7 | Current state of Ushiku-numa and investigation of water purification method
Ushiku 3rd junior high school Science Club | OJ8 | A survey and experiment to improve the water quality of the Koise river
Kokufu junior high school Kokufu
Environmental research club |
| OJ9 | Solve the mystery of Satoyama invasion of bamboo thicket
Tsuchiura fourth junior high school
Science Club | | |

③ High School Students (Main Convention Hall)

- | | | | |
|-----|---|-----|--|
| OH1 | Let's make Ibarakimachi more energetic!
~ The ECO activities of Ibaraki Higashi Senior High School ~
Ibaraki Prefectural Ibaraki Higashi Senior High School 『We are Hinumakko!』 | OH2 | The musical tells conservation activities of lakes and water birds
Cinderella, A Musical Company |
| OH3 | A firefly regeneration project in Moriyama City
Shiga prefectural Moriyama junior/high school SGH firefly regeneration research team | OH4 | Growing the ancient rice at "Yatsuda" in Shishizuka and the seasonal change in the freshwater plankton
Ibaraki Prefectural Takezono High School |
| OH5 | Efforts to solve the problem of waste garbage caused by inland parts in downstream waters
SANYO Girls Senior Junior High School
Geography and History Club | OH6 | Research of the Ecosystem in Lake Tazawa
Omagari Agricultural High School
Bioengineering Club |
| OH7 | Blue-green algae and measures the results of Senbako
Sakasagawa Children's Eco Club
Senbako biotope team | OH8 | The development of the new flocculants made from natural material
Seifu Junior and Senior high School
Biology club |
| OH9 | Water clarification system by organisms
Aomori Prefectural Nakui Agricultural High School TEAM FLORA PHOTONICS | | |

◆ Discussion

Discussion is divided into 3 divisions: Elementary School Students, Junior High School Students and High School Students

Theme “Blessing of nature and Mother water ~ For our symbiotic future ~”

Time 14:45-16:00

① Elementary School Students (Convention Hall 300)

- | | |
|---|--|
| DE1 Sakasagawa Children's Eco Club Salmon Ranger team | DE2 Ukishima elementary School |
| DE3 Tamari East Elementary School | DE4 Ramsar Biwa-Kids Ambassadors |
| DE5 Hokota-city Asahi north Elementary School | DE6 TANAKAMI children's Environment Club |

② Junior High School Students (Convention Hall 200)

- | | |
|--|---|
| DJ1 MITO EIKO JUNIOR HIGH SCHOOL Science Club | DJ2 Miho Junior High School Science Club |
| DJ3 AOBADAI elementary & middle school smile familia | DJ4 TANAKAMI children's Environment Club Middle school student team |
| DJ5 Kokufu junior high school Kokufu Environmental research club | DJ6 Chigakukan Secondary School IS-Scientific Course 1 |

③ High School Students (Main Convention Hall)

- | | |
|---|--|
| DH1 Cinderella, A Musical Company | DH2 Shiga prefectural Moriyama junior/high school SGH firefly regeneration research team |
| DH3 Ibaraki Prefectural Takezono High School | DH4 SANYO Girls Senior Junior High School Geography and History Club |
| DH5 Sakasagawa Children's Eco Club Senbako biotope team | DH6 Seifu Junior and Senior high School Biology club |

◆ Poster Presentation

Each groups present and explain their research and activity in front of poster made by them.

Theme “About nature related to lakes and blessing of nature”

Time 13:00-14:30

Venue Conference room 101, 102

① Elementary School Students

- | | |
|--|---|
| P1 Examine the blessings from Kitaura's water environment, find the splendor of Kitaura, and clean Kitaura !
Hokota-shi Shiratori Nishi elementary school | P2 To Save Our Mother Lake Kasumigaura
Tamari East Elementary School |
| P3 To protect the environment of Lake Hinuma
Nagaoka Elementary School 4th grade | P4 Water, Forests and People: Building sustainable water resource management in Northeastern Thailand
Metaneedol Elementary School, Thailand |

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|-----|--|-----|---|
| P5 | Exploring the natural environment and aiming for symbiosis
Hokota-city Asahi north Elementary School | P6 | Water Quality Rankings of Ponds in Tsukuba City Parks and Seasonal Variations from Spring to Summer
Doho Gakuen Tsukuba Municipal Ninomiya Elementary School |
| P7 | Living things in Kasumigaura
Ukishima elementary School | P8 | The water quality of Kasumigaura
Ukishima elementary School |
| P9 | Protect the natural environment of the area
Nature's grace and our present and future life
Ishioka City Kita Elementary School | P10 | Investigate living creatures of Lake Biwa and local wetland
TANAKAMI children's Environment Club |
| P11 | Incubation methods of fairy shrimp, "Honen-ebi" through the examination of water quality of their habitat
Mishima elementary school | P12 | Artificial insemination and hatching of WAKASAGI in Lake Kasumigaura -The food culture of wakasagi-
Kasumigaura City Kasumigaurakita Elementary School |
| P13 | A comparison of festivals in Kasumigaura City and Ishioka City-nature's blessings and culture
AOBADAI elementary & middle school
ART CLUB FAMILIAR | P14 | How human should use water from the view points of other living creatures ?
Kaichi Nozomi Primary School |

② Junior High School Students

- | | | | |
|-----|---|-----|---|
| P15 | Komon-sama's Fireflies Revival Project
MITO EIKO JUNIOR HIGH SCHOOL Science Club | P16 | A survey and experiment to improve the water quality of the Koise river
Kokufu junior high school Kokufu Environmental research club |
| P17 | Solve the mystery of Satoyama invasion of bamboo thicket
Tsuchiura fourth junior high school Science Club | P18 | The Features of Cyrenidae in Hinuma
Chigakukan Secondary School IS-Scientific Course 1 |
| P19 | Hinuma Produces a New Menu by Local Production for Local Consumption
Chigakukan Secondary School IS-Scientific Course 2 | P20 | Water Transportation System in Early Modern Hinuma Area
Chigakukan Secondary School IS-Scientific Course 3 |
| P21 | Action to bring up consciousness from a variety of experience-based activity to environment
yachiyo eco club | P22 | Water Quality of Lake Kasumigaura
Ami Junior High School Science Club |
| P23 | We follow a waterside with the oldness
Ogawa minami Junior high school | P24 | Search for sweet potatoes in Kasumigaura ~ Regional-food relationship ~
AOBADAI elementary & middle school |
| P25 | Species Richness and Distribution of Macroinvertebrates as Water Quality Bioindicator in Lake Dakong Napo and Agusan River, Mindanao Island, Philippines
SIBAGAT NATIONAL HIGH SCHOOL OF HOME INDUSTRIES | | |

③ High School Students

- | | | | |
|-----|---|-----|--|
| P26 | Let's make Ibarakimachi more energetic!
~ The ECO activities of Ibaraki Higashi Senior High School ~
Ibaraki Prefectural Ibaraki Higashi Senior High School 『We are Hinumakko!』 | P27 | Growing the ancient rice at "Yatsuda" in Shishizuka and the seasonal change in the freshwater plankton
Ibaraki Prefectural Takezono High School |
|-----|---|-----|--|

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|---|---|
| <p>P28 Efforts to solve the problem of waste garbage caused by inland parts in downstream waters
SANYO Girls Senior Junior High School
Geography and History Club</p> | <p>P29 Research of the Ecosystem in Lake Tazawa
Omagari Agricultural High School
Bioengineering Club</p> |
| <p>P30 The development of the new flocculants made from natural material
Seifu Junior and Senior high School
Biology club</p> | <p>P31 Production and installation of a water hammer pump for winter watering rice paddy making
Chiba prefectural Matsudo Minami high School Science and Research Club /
Water hammer pump Team</p> |
| <p>P32 Making and practical use of the water plant gage for ecosystem revival of lakes and marshes
Chiba prefectural Matsudo Minami high School Science and Research Club /
Water Plant Gage Team</p> | <p>P33 The color differences of sijimi and the water quality of its spot
Tokiwa University High School</p> |
| <p>P34 Influence from surrounding environment on water quality - contrast between the Nakagawa waters and Kasumigaura waters -
Mito Agricultural High School Natural Science Club</p> | <p>P35 Water quality survey of Lake Biwa and rivers around the school
Seta technical high school Chemical industry</p> |
| <p>P36 Water Quality Research in rivers around Hokuzan High School (Zininsa river, Shigema river, Ooi river)
Hokuzan High School Biology Club/
Water Quality Research Team</p> | <p>P37 River Research in Nakijin village
-Environmental evaluation of aquatic animals and water quality-
Hokuzan High School Biology Club/
Indicator Species Research Team</p> |
| <p>P38 Proposals to reduce pollution in the Shinkawa River
Tsukuba International University High School</p> | <p>P39 Water quality and aquatic organism of Nagamo river
Hokota second high school Biology Club</p> |
| <p>P40 Effect of divalent iron ion on aquatic environment
Kanagawa Prefectural Maritime Science High School</p> | <p>P41 A study on the value of agricultural products grown using fertilizer made from water weeds from Lake Biwa
Shiga prefectural Moriyama junior/high school SGH water weed research team</p> |
| <p>P42 Comparison of water quality survey and biological survey of Okita river and Hanazono river
Isoharakyoei High School Science Club</p> | <p>P43 Development of the Microbial Fuel Cell using the mud of the Lake Kasumigaura
Meikei High School Science Club /
biology group</p> |
| <p>P44 Purify water in Kasumigaura using only natural things
Meikei High School Chemistry Club</p> | <p>P45 A study of golden membrane and the water quality of the habitat of Hikarimo in Higashi-Namekawa Seaside Park
Hitachi First Senior High School Biology Club</p> |
| <p>P46 Connection with familiar water
Toyo University Ushiku Senior High School SOCIUS</p> | <p>P47 Research on freshwater turtles in Kobe, and conservation activities for Japanese domestic pond turtles
Kobe Yamate Girls' High School Kame-Love</p> |
| <p>P48 HIKARIMO (<i>Ochromonas vischeri</i>) in Mito City
Mito Daini senior high school Science Club</p> | <p>P49 Survey of water quality and fauna of the Tonbo pond
Ibaraki Nature Museum Junior Staff</p> |
| <p>P50 The Relationship between the Bluegills' Survival and the Covered Area of the Water Chestnuts in Mikata Lake
Wakasa high school 3rd science and mathematics course, The Bluegill Team</p> | <p>P51 Phototaxis by color in visible light of aquatic organisms
Tsuchiura Third High School Science Club</p> |

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| <p>P52 Is it possible to place Lake Kasumigaura on a waterfield ?
Tutiura third high school science Club</p> <p>P54 The effort of effective use method of Ulva which overglow at Yatsu-Higata Tidal Flat
Chiba Prefectural Tsudanuma High School Science Club / Biology Team</p> <p>P56 The feeding habit of Red-eared slider in Mikata Lake
Fukui prefectural Wakasa high school</p> <p>P58 Relation between life and the Water, between Science and the Water in Lake Kasumigaura ① Historical Background ② Gelation Experiment
Tsuchiura Nihon Univ. High School Current topics and Society Study Club Science Club</p> <p>P60 Chnages of fish fauna of Lake Senba Ibaraki high school</p> <p>P62 Distribution and Diversity of Freshwater Crustaceans (Arthropoda: Crustacea) with Notes on Socio-economically Important Species in Lake Dakong Napo, Esperanza, Mindanao Island, Philippines
SIBAGAT NATIONAL HIGH SCHOOL OF HOME INDUSTRIES</p> | <p>P53 Microorganisms growing in the beaker. Is there correlation with Kasumigaura?
Tsuchiura third high school Science club</p> <p>P55 Medaka circumstances in Lake Biwa, Yodo River basin, Tanakami district
~ Through DNA appraisal of medaka inhabiting lakes, rivers and rice field ~
TANAKAMI children's Environment Club</p> <p>P57 Evaluation of nutrients removal by triangle sail mussel (<i>Hyriopsis cumingii</i>) in Lake Kasumigaura
Tsuchiura First High School Biology Club</p> <p>P59 Discussion on biological system and alien fishes in Lake Kasumigaura
Mitsukaido Primary High School</p> <p>P61 About living together with nature and humans
Torideseitoku school drama club & karuta club</p> <p>P63 The musical tells conservation activities of lakes and water birds
Cinderella, A Musical Company</p> |
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MEMO

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Note: Underlined author is the presenter. In case the authors is not the presenter, the name will not be underlined.

Keynote Speech

Future of Lakes under Global Environmental Change



Nobuo Mimura

President, Ibaraki University

Lakes are exposed to two pressures recently; human-induced pressure such as pollution loads discharged from the surrounding areas, and impacts of global warming. What should we do to create desirable future where humans and lakes can coexist harmoniously? In this lecture, I will discuss the way to activate the lake's ability to adapt to the environmental changes, and importance to utilize the ecosystem services fully including rich and varied food and landscape resources.

Curriculum Vitae

Completed the doctoral course in engineering, School of Engineering, the University of Tokyo in 1979 (Doctor of Engineering). Specializing in earth environmental engineering and coastal engineering. Promoting the research project on climate change impact assessment and adaptation in Japan and Asia-Pacific countries. Participated in the UN Intergovernmental Panel on Climate Change (IPCC) as an expert from 1992 and served as a coordinating lead author (CLA) and lead author (LA) for IPCC Assessment Reports (2nd Report to 5th Report). Domestically served as a ministerial committee member for Ministry of Education, Culture, Sports, Science and Technology, Ministry of the Environment, Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Foreign Affairs as well as a prefectural committee member for Ibaraki Prefecture.

Career

April 1979	Research Assistant, Department of Civil Engineering, Faculty of Engineering, the University of Tokyo
January 1983	Associate Professor, Department of Civil Engineering, Faculty of Engineering, the University of Tokyo
April 1984	Associate Professor, Department of Urban and Civil Engineering, College of Engineering, Ibaraki University
1987 to 1988	Research Associate, California Institute of Technology
April 1995	Professor, Department of Urban and Civil Engineering, College of Engineering, Ibaraki University
1997 to 2000	Doubled as Professor, Graduate School of Engineering, the University of Tokyo
May 1997	Professor, Center for Water Environment Studies, Ibaraki University
September 2004	Vice President Extraordinary, Ibaraki University
May 2006	Director, Institute for Global Change Adaptation Science, Ibaraki University
April 2014	Vice President, Ibaraki University
September 2014	President, Ibaraki University

Policy Forum

OVERVIEW OF DISCUSSION

Saburo Matsui

Chairperson, 17th World Lake Conference Project Promotion Committee

In order to conserve lake environment, it is necessary for everybody involved in lakes, such as residents, agriculture, forestry and fishermen, business operators, researchers, government administrators, play a role in their respective positions. In particular, the policy directors are responsible for the planning and promotion of lake conservation measures.

In the policy forum, we hope to summarize the direction of future lake conservation measures through the presentations and discussion made by domestic and foreign policy makers.

First of all, on behalf of the venue, Ibaraki prefecture Governor will report about the current state of Kasumigaura and new initiatives. In addition, the Ministry of Land, Infrastructure, Transport and Tourism, the Ministry of the Environment, and the Ministry of Agriculture, Forestry and Fisheries Policy Officers plan to give opinions and discuss water quality remediation and ecosystem conservation efforts from the positions of each ministry.

Also, we expect to receive a wide range of global viewpoints opinions from the United Nations Environment Programme. We also expect reports on efforts and future issues from the Balaton Lake Development Council of Hungary, the venue for the 3rd World Lake Conference, where Lake Balaton, is a lake shallow similar to Lake Kasumigaura.

Lakes Session (World Lakes Session): Case Study Presentation

Global challenges for valuing, assessing and monitoring lakes and wetlands

Colin Maxwell Finlayson^{1,2}

¹Institute for Land, Water & Society, Charles Sturt University, ²UNESCO-IHE, Institute for Water Education, Delft

The status and trends of lakes and wetlands are examined using indicators that illustrate the despite considerable conservation effort over the past 4-5 decades they are in continuing decline. Similar trends are evident for ecosystems and species populations with a few exceptions. These declines have occurred despite the high value of the ecosystem services that lakes and wetlands provide for people. Total economic valuation of lakes and wetlands shows that they are worth more than many other biomes yet pressures from increasing human populations and economic development are still resulting in ongoing declines. This situation is not new - it has been described on many occasions and in many parts of the world. It is exacerbated as recent data for the area of lakes and wetlands has led to an increase in the total economic value of these ecosystems in comparison to others. More recent efforts to promote the UN Sustainable Development Goals as a way forward for humankind offer renewed hope for lakes and wetlands. This is particularly the case as lakes and wetlands are central to achieving many of the targets that have been agreed under these goals. For the Sustainable Development Goals to be successful there needs to be a concerted effort across sectors and across all ecosystem services. Single attention to particular goals or targets or ecosystem services is unlikely to halt and reverse the declines in lakes and wetlands that we have experienced for many decades. Our challenge is to find a way forward that recognises multiple values and the vital role that lakes and wetlands play in sustaining our landscapes and our future.

UNTANGLING THE MANAGEMENT CONUNDRUM OF KENYAN LAKES

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Kenya has both fully internal and transboundary lakes that have come under intense pressures from anthropogenic uses and activities within the lakes themselves and their catchments. Climate changes are compounding the pressures of the quantity, quality, function and ecosystem health of these lakes. There is, however, no specific policy, legislative and governance regime to address the lakes management in a holistic and sustainable manner. This paper addresses this gap and provides a framework within which an Integrated Lentic-Lotic Basin Management (ILLBM) approach can be applied (institutions, policies, participation, technology, information, and finance) to ensure the sustainable management of the lakes and their supporting natural and built infrastructure in the context of balancing conservation and development.

Keyword: ILLBM, Governance, Management, Lakes

CHALLENGES OF INTEGRATED MANAGEMENT OF THE LERMA-CHAPALA BASIN, MEXICO

Alejandro Juárez Aguilar

Director General, Corazón de la Tierra

Lerma-Chapala basin is allocated in Central-Western Mexico, with a surface of 52,320 km². It's composed by 19 sub-basins, each one with a main river and/or lake, altogether linked in a convoluted process which generates a series of ecosystem services, benefiting 16 million people. This basin is a complex territory with a variety of ecosystems, productive activities and cultural manifestations, which generates 12% of GDP, mainly by ranching, crop cultivation, industry and commerce, all of this in an area with increasing water scarcity. From the perspective of the Environmental Services Framework this generates strong challenges, due to low generation of information about key aspects, besides the deficient access of decision-makers and general population to such knowledge. In an effort to improve this, three strategies have been fostered to improve such tendency: 1) improvement of key data, 2) increasing access to information of the basin for general public and 3) creation-strengthening of partnerships, in order to escalate the process. As part of these approaches, a total of 94 projects have been completed, mostly in the Lake Chapala sub-basin but also in another sub-basins, in a collaborative effort with institutions from Mexico and from abroad. A powerful tool to guide this process is the Integrated Lake Basin Management Platform. This paper reviews outcomes of such strategies, the difficulties of the process and how they were dealt with, in order to involve stakeholders into the integrated management of Lerma-Chapala basin, a strong collaborative effort with still a defiant way ahead.

Keyword: Environmental Services Framework, ILBM, partnerships, livelihood

Lakes Session (World Lakes Session): Panel Discussion

OVERVIEW OF DISCUSSION

Masahisa Nakamura

Vice President, ILEC

In the World's Lakes Session, each of the three panelists will report on the wetlands and lakes in Asia and Oceania, on the lakes in the African Rift Valley region, and on the largest lake in Mexico and its river basins, and will attempt to give the audience a glimpse of the world's efforts on lake basin management experiences and challenges faced today and in future. The case study presentations will include the deterioration and its impacts on lake ecosystem functions caused by various stresses originating from anthropogenic activities in the lake basin, the environmental changes taking place in reference to the geo-historical time scale, and the collaborative activities for restoration of water quality and ecosystem functions involving government, industry, scientific institutions and lake basin residents. The panel discussion following the above presentations will address the need for wide-ranging and continuous efforts to restore the ecosystem functions in lakes and watersheds, for improvement of basin governance reflecting the concept of ecosystem services, and for international collaboration to pursue emerging and related issues, with participation from the audience.

Lakes Session (Japanese Lakes Session): Case Study Presentation

THE FOURTH HINUMA ENVIRONMENT FESTIVAL RAMSAR SYMPOSIUM IN HINUMA

Yaeko Yahagi

Vice chair, Executive Committee of 17th World Lake Conference Satellite Hinuma

Ibaraki Town, located at the center of Ibaraki Prefecture, is a rural city with the peaceful living atmosphere that is blessed with a rich natural environment of water and greenery, such as "Hinuma Lake." Hinuma, the symbol of Ibaraki Town, is the only brackish water lake in the Kanto region of Japan (Tokyo metropolitan area). Represented by "Hinuma Ito-Tombo (Mortonagria hirosei)" which is named after the lake, it provides habitats for the wide variety of wild species such as the migratory scaup "Suzugamo," "O-washi (Steller's Sea Eagle)," "Osekka (Marsh grassbird)" and many other flora and fauna. It was designated of the Ramsar Convention (Convention on Wetlands of International Importance especially as Waterfowl Habitat) in May 2015.

However, after entering the Showa era (after 1925), once Hinuma's water quality was deteriorated, and the original beauty has been impaired, due to the changes in the environment such as the increase of population of the river basin, economic growth, reclamation, and reclamation project. On September 30th, the Ibaraki Town, as one of the satellite venue, we have hosted the fourth Hinuma Environment Festival: Ramsar Symposium in Hinuma. We discussed our required action for conservation of the rich natural environment of Hinuma and for receiving the bounty of its natural resource sustainably.

MITO CITY ENVIRONMENTAL FAIR 2018 ~ GIFTS OF SENBA LAKE ~

Seiji Sakuraba

Vice Chair, World Lake Conference Satellite Working Group, Executive Committee of Mito City Environmental Fair 2018

Mito City is the prefectural capital located at a distance of about 100 kilometers from Tokyo with a population of about 270,000 people. Roughly in the center of the city is Kairakuen Park, which is one of the three great gardens of Japan, and Senba Lake. Mito City is a historical city where Mitsukuni Tokugawa, who is known as Mito Komon, and Yoshinobu Tokugawa, who was the last shogun, lived and many tourists visit its plum festival.

Senba Lake is a place where people can relax surrounded by nature and symbol of Mito City, however, because of the little water flowing into the lake, the outbreak of blue-green algae is an issue during summer months and the government and public have been engaged in measures against blue-green algae together.

For the Mito City Environmental Fair, a biotope challenging the public what to do to take over the responsibility for this rich nature in the future and events incorporating programs including fishing of non-native species and allowing the public to learn from experience were created. For the symposium, grown-ups and youths also had an earnest discussion and increased their awareness of the importance of environmental conservation.

THE COOPERATION WITH VARIOUS ORGANIZATIONS BY UNIVERSITY STUDENTS IN REMOVING ACTIVITY OF INVASIVE ALIEN AQUATIC WEED IN LAKE BIWA, JAPAN

Koki Ozaki

Invasive Alien Aquatic Weed Removal Management Team Manager, Nonprofit Organization International Volunteer University Student Association (IVUSA)

In Lake Biwa, Water primrose *Ludwigia grandiflora* was first found in 2009. It reached 300,000 square meters within 7 years. Because of an amazing ability to propagate, it was designated as a specific alien species in 2014. In 2013, almost all people don't know the problem, commercial fishermen who were elderly were mainly engaged in removal activities, and removal of aquatic plants was a heavy work. Against these problems, the activities began with the desire of student to save Lake Biwa by the power of young university students.

We, IVUSA (International Volunteer University Student Association), started activities from 2013. We have carried out 40 removal events in which a total of 9,543 persons were participated including administrative officers, regional environmental organizations, commercial fishermen, and local residents. As much as 320 tons of water primrose was successfully removed. As a main activity, we regularly conduct removal activities and we organized large scale removal events by more than 1,000 students for 3 days every summer vacation. Also we have tried to raise regional awareness and crisis consciousness of this problem by carrying out an education for children and exhibitions for stakeholders. Through these activities, we are aiming for complete removal by establishing an organization that can detect and remove it at an early stage.

Lakes Session (Japanese Lakes Session): Case Study Presentation

TRANSDISCIPLINARITY AIMED AT SOUND HYDROLOGIC CYCLE IN INBANUMA WATERSHED

Akihiko Kondoh

Professor, Center for Environmental Remote Sensing, Chiba University

Inbanuma (Inba Lake) is a closed lake located in Tokyo metropolitan area, and serves as a water resources of Chiba Prefecture. To improve water quality and to create a safety in flood, vigorous and comfortable region to live in, Chiba Prefecture founded a council for sound hydrologic cycle in Inbanuma watershed in 2001. Taking opinions of citizens, action plan for improving the environment in Inbanuma watershed was decided in 2013. The activity includes collaborations among different sectors, such as "MITAMESHI Activity"(adaptive management), with the holistic viewpoint subsuming multiple subjects in the watershed. Despite all the effort, water quality in Inbanuma did not show the signs of improvement. On the other hand, most of the residents in the watershed do not notice the relationship to Inbanuma. So, the exchange meeting of Inbanuma watershed was established in 2014 to loosely connect all the stakeholders who share the achievement of the objectives for sound hydrologic cycle and regional creation in Inbanuma watershed. This is a trial for the realization of transdisciplinarity that has been targeted in SDGs(Sustainable Development Goals) and Future Earth(scientific framework to establish SDGs).

HITACHI ENVIRONMENTAL MANAGEMENT AND WATER TREATMENT SYSTEM FOR CONTRIBUTING TO ENVIRONMENTAL CONSERVATION

Makoto Onishi

Chief Technology Officer, Water Solutions Division, Water Business Unit, Hitachi, Ltd.

It became the times when sustainable development goals, so-called SDGs which the United Nations set in 2015, attracted attentions in various scenes. ESG (environment, society, governance) is regarded as important for an index to evaluate a corporate value, and consideration for the environment becomes extremely important in the corporate activity. Hitachi, Ltd. promotes resolutions of social/customer issues through our social innovation business and works on environmental conservation.

In this presentation, I introduce the new framework for Hitachi environmental management which realizes low-carbon, resource efficiency, and natural harmonizing society. Furthermore I introduce the nitrogen and phosphorus removal system from the sewage or lakes water for contributing to environmental conservation.

THE HISTORY OF LAKE BIWA'S WATER ENVIRONMENT CONSERVATION AND SHIGA'S NEW INITIATIVES

Naoki Komatsu

Director General, Shiga Prefectural Government

The initial push toward restoring the water quality of Lake Biwa came from housewives who took a leading role in initiating a public movement to make the switch from synthetic detergents to organic soap in the late 1970s, when fresh water red tides were observed. In response to the movement, the Shiga Prefectural Government established an ordinance prohibiting the use of synthetic detergents. It also improved sewers and created regulations on industrial waste water, improving water quality to a certain level. However, there are still many problems regarding loss of ecosystems, such as the decrease in endemic species, the increase in invasive species, and the overgrowth of waterweed. Based on the Lake Biwa Comprehensive Conservation Plan (Mother Lake 21 Plan), which was revised in 2011, the Shiga Prefectural Government has promoted initiatives to address these problems in collaboration with various parties such as governments, citizens, NPOs, researchers and companies. In addition, Shiga is conducting investigations and research toward introducing the use of TOC (or Total Organic Carbon), with which all organic matter can be measured, in order to manage water quality and preserve the ecosystem.

Lakes Session (Japanese Lakes Session): Case Study Presentation

ACTIVITIES FOR ENVIRONMENTAL RESTORATION OF LAKE TAZAWA -TOWARDS HOMECOMING OF KUNIMASU-

Naoteru Odano

Director-General for Regional Revitalization and Comprehensive Strategy, Semboku City, Akita Prefecture

In Lake Tazawa, fishing has been actively carried out until 1930's and the endemic species in Lake Tazawa, *Oncorhynchus kawamurae* (common name "Kunimasu trout"), inhabited. However, most of the species inhabited in Lake Tazawa, including Kunimasu, died after introduction of highly acidified water of Tamagawa river to Lake Tazawa for irrigation and electric-power generation in 1940. In 2010, it was confirmed that Kunimasu, which had been believed to be extinct, are living in Lake Saiko, Yamanashi Prefecture. On this occasion, Semboku city has started "Restoration of Lake Tazawa and Kunimasu Homecoming Project" and has been carried out activities for environmental restoration of Lake Tazawa. In 2017, a facility to display Kunimasu and dispatch information of history and culture of Lake Tazawa and messages to future was opened. The facility is also utilizing as a place of environmental study for children and students. One of future issues is to accelerate activities for restore environment that Kunimasu may swim in Lake Tazawa again continuing utilization of Lake Tazawa for irrigation and electric-power generation.

WASTEWATER AS A RESOURCE: MICROALGAE CULTIVATION IN A SEWAGE TREATMENT CENTER

Mitsuru Izumo

CEO, euglena Co.ltd.,

We, euglena Co., Ltd. is a venture company which had reached the world's first successful outdoor mass culture of edible microalgae Euglena. We are trying to create new solutions for global food issues and environmental problems with it. We have been working on multifaceted business development primarily in healthy food and cosmetics areas. At the same time, as Euglena is a single-celled organism that photosynthesizes highly efficiently, we have been studying for addressing CO2 emissions reduction as well as for utilizing Euglena in biofuel and feed.

The B-DASH Project in Saga prefecture was conducted to test if unused resources in sewage treatment such as CO2, Nitrogen and Phosphorus can be used for Euglena cultivation. Then we investigated whether such Euglena can be used for feed or fertilizer as high valued products. In order to sell such Euglena in feed or fertilizer markets, it is necessary to pass safety tests which are required by legal authorities. Once we reach the realization of value-adding utilization of unused resources in wastewater, it will broaden opportunities of environmental businesses for a sustainable society.

Lakes Session (Japanese Lakes Session): Panel Discussion

OVERVIEW OF DISCUSSION

Takehiko Fukushima

Director, Ibaraki Kasumigaura Environmental Science Center

“Lake Session (Japanese lakes)” is held to discuss within-basin and between-basin cooperation activities for sustainably utilizing the blessings of ecosystem services from Japanese lakes. At first, Dr. Masahisa Nakamura, vice President of ILEC, will introduce the present and future environmental problems in world lakes. Next, the government officers from ME and MLIT show new policies and programs in lake management, and the researchers explain the examples of cooperation activities and new indices for ecosystem service. Based on these information, we shall discuss 1) what problems Japanese and foreign lakes are facing or will face? 2) how do we utilize ecosystem services sustainably? and 3) what types of within-basin and between-basin cooperation activities are needed for it?

NEW INDEXES OF WATER ENVIRONMENTS CONSIDERING ECOSYSTEM CONSERVATION IN LAKES

Kazuya Kumagai

Director, Water Environment Division, Environmental Management Bureau, Ministry of the Environment

Although there has been reduction in inflow load from land based on the lake plan, the achievement ratio of water environmental quality standards of domestic lakes has been stagnant at approximately 50%. There are also problems of poor oxygen water mass in bottom layer, overgrowth of aquatic plants, and decrease in native aquatic life, and there are indications that there is difficulty in conveying the current situation of water environment only using achievement ratio of past environmental quality standards.

In order to improve the situation and make the goals and evaluation of lake water environment easier to understand for the public, the Ministry of the Environment implemented new water environment indexes (amount of bottom layer dissolved oxygen and Littoral water transparency) in 2016 March.

Amount of bottom layer dissolved oxygen was set as living environmental standard in terms of securing dissolved oxygen for inhabiting aquatic life, and Littoral water transparency was set as a regional environmental objective in terms of recreational use and conservation of aquatic plants.

We will continue approaches to penetrate measures utilizing new indexes and to achieve favorable water environment in various lakes.

ENVIRONMENTAL CONSERVATION EFFORTS IN LAKES BY THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM

Masashi Iwai

Senior Deputy Director, River Environment Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism

During the period of high economic growth in Japan, the quality of the water in rivers and lakes has worsened with the progress of industrialization and urbanization, and this has influenced ecosystems. In cooperation with the relevant organizations such as sewer managers, local governments and river administrators, MLIT has worked to improve water quality in the rivers and lakes where the worsening of the water quality has been remarkable. As a result, the quality of the water in rivers and lakes has been gradually improving.

Rivers and lakes are vital components of the nation's land ecological networks that connect forests, farmlands and cities as integrated areas. MLIT is working to “nature-oriented river works” in order to conserve and create such things as the habitat, growth and breeding environments for living things that are naturally living in the rivers. Currently, in cooperation with diverse entities, MLIT has expanded its viewpoint from not only “nature-oriented river works”, which mainly focused on rivers, to promoting the creation of attractive and dynamic river basin areas through the conservation of biodiversity, and introducing such initiatives.

Lakes Session (Japanese Lakes Session): Panel Discussion

LAKE WATERSHED COLLABORATION IN JAPAN

Shinji Ide

Professor, School of Environmental Science, the University of Shiga Prefecture

To understand the current situation of watershed collaboration for lake conservation in Japan, the authors conducted questionnaire survey in 2018. In the survey, we asked local governments having a conservation plan for a specific lake if there were any collaborative projects with citizens or citizen groups carried out within the plans and, if any, what kinds of projects were they? As a result of the survey, it was revealed that types of collaboration in those projects could be classified into five steps, namely, Step 1: collaboration with unspecified number of individuals and groups (25 cases), Step 2: one with council-type organizations (35 cases), Step 3: financial and public relations support (15 cases), Step 4: joint planning and implementation (14 cases), and Step 5: division of roles (26 cases). It was also suggested that types of collaboration tend to be more diverse and varied as the problems facing respective lakes become diversified.

WATERSHED GOVERNANCE TO ENHANCE SOCIAL-ECOLOGICAL HEALTH

Noboru Okuda

Associate Professor, Research Institute for Humanity & Nature

Degradation of aquatic environments and loss of interests in aquatic culture are considered environmental issues common in watersheds of economically growing Asia. Within the watershed, each of local communities has a site-specific social issue. Toward the solution of both social and environmental issues, we need transformation of values oriented to social-ecological health of watershed system through social involvement in environmental governance. Here I propose the watershed governance to enhance the social-ecological health, which is assessed by three indices, biodiversity, nutrient cycling and well-being. For diverse stakeholders to be involved in this governance, it is effective to incorporate community-based cultural approach into the science-based watershed management. For this purpose, my project practices action research to empower local communities for conservation of the familiar nature of wetlands through sharing their indigenous cultural values among community members, especially between generations, which results in enhancement of the above three indices at the local scale. In my talk, I introduce case studies in Lake Biwa of Japan and Laguna de Bay of the Philippines, which are considered a model for infrastructure-oriented and high-loading societies, respectively, in order to discuss applicability of this governance approach to a variety of watersheds in Asia.

Lake Kasumigaura Session: Case Study Presentation 1

IBARAKI PREFECTURAL GOVERNMENT'S EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA

Mieko Kuwana

Executive Director, Department of Residential and Environmental Affairs, Ibaraki prefectural Government

Lake Kasumigaura, located in the southeastern part of Ibaraki Prefecture, is a vast waterscape and part of a diverse natural environment. Along with the towering Mt. Tsukuba on its northwestern side, it is a beautiful sight to behold representing Ibaraki Prefecture. The lake water is also used for domestic, agricultural, and industrial uses; and the lake is blessed with an abundance of aquatic resources.

However, since nearly one million people live in the watershed, and industries such as agriculture and livestock are also popular around the region, nitrogen and phosphorus, which are the causative agents of eutrophication, flow into the lake, thus making it easily polluted. In order to improve the quality of Lake Kasumigaura, Ibaraki Prefectural Government has established a Water Quality Conservation Plan, and is promoting domestic wastewater management. The government also seeks to reduce pollutant loads via agricultural land- and livestock-related countermeasures; and is promoting information dissemination, environmental learning, as well as awareness raising activities. Furthermore, in order to implement the plan fully, the Kasumigaura Water Quality Conservation Ordinance was enacted to regulate that the people in the basin ensure water conservation in all aspects of everyday life and production. The government also introduced a local tax called 'Forest and Lake Environment Conservation Tax,' and uses it as a financial resource to accelerate the efforts.

WATER ENVIRONMENTAL IMPROVEMENT IN LAKE KASUMIGAURA

Tsuyoshi Tatsuno

General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, MLIT

The water environment of Lake Kasumigaura brings diverse benefits to us. In the Kasumigaura basin, flood damage and salt damage frequently occurred in the past. As a result, the flood control plant has been raising the safety and security of the area, making it possible to use water stably in the Tokyo metropolitan areas by the water utilization project. While urbanization of river basins and development of social infrastructure have been progressing, problems of water environment such as water pollution, loss of lake shore vegetation zone and loss of lake water bathing spots have become apparent. In order to respond to these issues, the Kasumigaura River Office will continue to provide diverse benefits of the environment of Lake Kasumigaura water based on the "Lake Kasumigaura River Development Project" and "Lake Water Quality Conservation Plan for Lake Kasumigaura (Seventh Phase)". In order to sustainably enjoy and take the benefits over to the children of the future, the people in the basin are unitedly taking efforts to improve water quality, conserve and restore the natural environment, maintain good mutual relation between the river and the people, preserve and form landscape, promote environmental education and carry out basin- wide comprehensive river management.

ECOSYSTEM SERVICES OF LAKE KASUMIGAURA AND THE ECONOMIC EVALUATION THEREOF

Kazuhiro Ebata

Vice President, Ibaraki Kasumigaura Environmental Science Center

People receive diverse benefits (ecosystem services) from Lake Kasumigaura; for these to continue to be available in the future, it is necessary to the nature and magnitude of the services received and link them to lake management. Therefore, we organized the components of ecosystem services of Lake Kasumigaura and examined the changing of the amount of enjoyment of services and the current economic value. It was revealed that items enriching human activities, such as water use, increased, and items related to flora and fauna, such as fish and aquatic plants, decreased. It also became clear that trying to raise the value of one ecosystem service lowers the value of another ecosystem service. To resolve this problem and to enable people to coexist with the lakes, collaboration and discussion among all stakeholders concerned with Lake Kasumigaura is important.

Lake Kasumigaura Session: Case Study Presentation 2

DELIVERING THE RICHES OF LAKE KASUMIGAURA TO FUTURE GENERATIONS: THE FUTURE OF THE FISHING INDUSTRY IN LAKE KASUMIGAURA

Ichiro Ito

Group Director, Kasumigaura Marine Products Research Group, Kasumigaura Fishermen's Association

The fishing industry has long prospered alongside Lake Kasumigaura, in particular the pond smelt, icefish and river prawn industries. However, changes in the lake's usage as a water source and a decrease in the aquatic plants that provide a habitat for fish have resulted considerable changes in fishing grounds and increasing instability in the fishing industry.

In order to maintain the fishing industry and pass the riches of Kasumigaura on to future generations, we, Local fishermen, have decided on rules such as limiting fishing time in response to the state of environmental resources and are working towards using resources in an appropriate way. Furthermore, in order to increase the pond smelt that Kasumigaura is known for, we have introduced an artificial hatching programme as well as environmental improvement projects such as reed bed conservation.

We hope to maintain the riches of Lake Kasumigaura for the future so that everyone has the chance to savor Kasumigaura fish. We also hope that you will join us in understanding and cooperating with this project.

PRODUCTION OF LOTUS ROOT HARNESSING THE BOUNTY OF LAKE KASUMIGAURA

Masami Iida

Section of lotus root in Japan Agricultural Cooperatives Tsuchiura

Lotus root is crop that is mainly in demand at New Year's and seasonal festivals as a lucky charm. Abundant water resources and organically-rich soil is essential for growing lotus root. For this reason, the number of areas where lotus root can be produced in Japan is incredibly limited.

Japan's largest lotus root production area has been formed in areas with the morass around Lake Kasumigaura in Ibaraki Prefecture, centered around Tsuchiura City and Kasumigaura City, where the area's abundant water resources and rich soil can be used.

Here, we will introduce the actual conditions of production areas and initiatives taken at production sites from the perspective of producers on lotus root production that utilizes the bounty of Lake Kasumigaura.

KASHIMA WORKS RELATIONSHIP WITH WATER FROM KASUMIGAURA

Kenya Tada

Director, Nippon Steel & Sumitomo Metal Corporation KASHIMA WORKS, Safety, Environment & Plant Safety Division

- Nippon Steel and Sumitomo Metal will contribute to the creation of a sustainable society by promoting the "three ecos," namely: Eco Process (The way we manufacture is eco-friendly), Eco Products (The goods we produce are eco-friendly) and Eco Solution (The sharing of our eco-solutions).
- Kashima Works manufactures steel sheets, steel plates, pipes and tubes and H-section steel. Its crude steel production capacity is over 7 million tons a year.
- Steel is produced by melting iron ore in the blast furnace, solidifying it in the continuous casting machine and rolling it in the hot-rolling mill. In the manufacturing process, water is essential. Water cools facilities for protection from high temperature steel and directly washes off the steel surface to improve steel quality.
- About 2.6 million tons of water are used in a day. Some water is vaporized due to the cooling of high temperature steel or washing off the steel. Most of the remaining water is recovered for effective use of water resources. The recycling rate is 90% or more. To replenish the loss from vaporizing, about 230,000 tons of new water are supplied in a day from Kasumigaura.

Lake Kasumigaura Session: Case Study Presentation 2

REGIONAL REVITALIZATION PROJECT USING CYCLING ROAD ALONG KASUMIGAURA

Hirotsugu Konno

Kasumigaura Mirai Creation Company

As social problems such as the declining population of the region and industrial decline attract attention, various efforts are being implemented in each local government as a regional creation plan. In Kasumigaura City, Ibaraki Prefecture, paying attention to the fact that many people visit the "Tsukuba Kasumigaura Rin Lin Road" bike path along the Lake Kasumigaura. Aiming for continuous exchange population expansion, JTB Kanto Co., Ltd., Hakuho Co., Ltd. and Stitch Co., Ltd. have developed a cycling program utilizing regional resources. Kasumigaura, Tsukuba Bank, Ltd. and Stitch Co., Ltd. contributed through the development of the program, and in order to promote the business, "Kasumigaura Future Creation Co., Ltd." was established in April 2016.

Through the three projects of Kasumigaura City's local cycling program "Kasumigaura Ride Quest", the local production area disappearance restaurant "Kasumi Kitchen" and local product "Kasumi Marche" to undertake efforts to experience the charm of Kasumigaura I aim for it.

THE REPORT ON THE PRACTICE OF WATER PURIFICATION METHODS BY "WOMEN'S GROUP FOR LIFESTYLE SOLUTION"

Masako Fujiwara

President, Ibaraki Life School Liaison Committee

I was very impressed by the taste of the Itako city tap water, I moved in 1974. I remember it tasting very good. Since then, I have implemented many methods to purify the water in Kasumigaura Lake for many years. For example:

- Action 1: Distributing handmade acrylic scourer for diminishing the discharge of detergent and sewage water into Kasumigaura Lake.
- Action 2: Reusing water at home, mainly from bathtub.
- Action 3: Reusing cooking oil to produce oil candles.
- Action 4: Surveying dietary habits and listing food waste.

If everyone reduced waste with even a little sense of regret, we will revive the "Mottainai" spirit, and achieve real improvement in the water purification at Kasumigaura Lake. I believe we should be more concerned with the environmental issues our planet is currently facing.

Lake Kasumigaura Session: Case Study Presentation 3

CITIZENS ACTIVITIES PARTICIPATING IN WORLD LAKE CONFERENCE

Toshio Takishita

Vice President, 2018 Citizens' Association that works closely with the World Lake Conference

During the 6th World Lake Conference, the citizen group worked together to contribute to the success of the event, activated environmental conservation and regional activities, and got to know each other.

Considering the importance of this citizen group collaboration, we formed the World Lake Conference Citizens' Association '18 in 2016.

In cooperation with the World Lake Conference from the citizen's point of view, we will accomplish various activities related to the World Lake Conference in various places in Ibaraki Prefecture, and will lead to success by partnership and cooperating with each other.

Here, we will introduce the events that citizen groups mainly planned and implemented, and the activities they are usually practicing.

PARTNERSHIP FOR TAKE OVER THE ECOSYSTEM SERVICE OF LAKE KASUMIGAURA TO THE FUTURE

Akira Abe

Chair, Kasumigaura Citizens' Association

Executive Committee of Satellite Tsuchiura has held three events related to Lake Kasumigaura. The first one is 'The Citizen's Festival for Swimmable Lake Kasumigaura'. This annually held event has been organized by citizens since 6th World Lake Conference. This year six high school students debated the future vision of lakes and watershed. The second one is 'Summer Festival in Kasumigaura Environmental Science Center.' In this event, presenters including the special lecture, workers for fishery, farming and forestry, NPO members (Satoyama conservation) and university students dialogued the future vision of lakes and watershed, then talked about charm and conservation of Lake Kasumigaura. Additionally, quiz event for children was held. The third one is 'Satellite Tsuchiura Main Events'. In this event, many participants including civic groups, businesses and administrators working for Lake Kasumigaura discussed common goals for 'future vision of Lake Kasumigaura' after sharing and understanding what they have done. We are aiming for whole generations keep loving Lake Kasumigaura.

TOWARD A "SYMBIOTIC" SYSTEM BETWEEN HUMAN AND NATURE BASED ON A RECONSTRUCTION OF CULTURE OF EATING FISH IN LAKE KASUMIGARA

Takashi Chiba

Chief clerk (Curator), Kasumigaura city museum of history

When considering the relationship between human and natural environment in the Lake Kasumigaura region, the two important factors are fishing and culture of eating fish. As the human society develops, the nature of relationship between human and natural environment changes. In Kasumigaura City, we at the Kasumigaura Municipal Museum of History organized a series of activities to consider the symbiotic relationship between human and Lake Kasumigaura from the standpoint of local folk culture, such as fishing and fish consumption. This year, we have organized the "Fishing Sailboat Festival 2018" in connection with the World Lake Conference, a series of lectures and symposia entitled "Fishing Sailboats and Fish Consumption Culture in Lake Kasumigaura," and special exhibition "Fishing Sailboats in the History of Fishing in Japan." Now, we use fishing sailboats as the symbol of local sightseeing and intend to promote fish in Lake Kasumigaura as a local brand. It is our hope to reconstruct fishing and culture of fish consumption by sales of fresh local fish and other local products and by sightseeing using fishing sailboats. We believe that such reconstruction will eventually lead us to the environmentally sustainable society and symbiotic relationship between human society and the rich ecosystem of Lake Kasumigaura.

Lake Kasumigaura Session: Case Study Presentation 3

HOKOTA, A TOWN LIVING IN HARMONY WITH NATURE

Shigeo Oki

Hokota Regional Promotion Conference, Natural Environment Section, Section Leader

Hokota City is located amid rich nature surrounded by waters including the Kashima Sea and Lakes Kitaura and Hinuma, vast farmlands and village forests in a diluvial upland, and it mainly depends on agriculture. Because Hokota was once a prosperous water transport hub, it is also characterized by lakes/wetland and residential areas in close proximity. The city positions the preservation and utilization of natural resources as an important item in the Second Comprehensive Plan and the Basic Environmental Plan and is trying to improve the water quality of inflowing rivers within this context. Also Civic groups, in addition to trying to preserve and revive the precious natural environment, are going ahead with the idea of utilizing it in economic activities as part of an ecosystem service. In order to make such activities and the local mood known to those in the city, in Ibaraki Prefecture, in Japan, and outside Japan, we successfully hosted various events in the Hokota City satellite venue for the World Lake Conference. We are going to address various issues through public and private cooperation to be committed to "a town living in harmony with nature."

GROWING THE ANCIENT RICE AT "YATSUDA" IN SHISHIZUKA AND THE SEASONAL CHANGE IN THE FRESHWATER PLANKTON

Taichi Sukegawa

Student, Ibaraki Prefectural Takezono High School

In 2015, the United Nations set 17 Sustainable Development Goals (SDGs). We have "Life on Land"; protect, restore and promote sustainable use of terrestrial ecosystems, sustainability manages forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. We cultivated a rice field, have grown ancient rice using the natural firming method; organic and non-fertilizer in the local forest area called Shishizuka.

Shishizuka was selected as Satoyama of importance to save biological diversity in 2015. Satoyama is undeveloped woodland near populated area.

Shishizuka is used both for animal habitat and for water source because there are not enough big feeder rivers to the lake of Kasumigaura. In these days, it is difficult to maintain paddy field of Yatsuda. Yatsuda is with the situation of decreasing the number of farmers, urbanization and aging farmers. As a result, the abandoned field is spreading rapidly. Also, due to losing animal habitat, ecosystem of whole Satoyama will be destroyed. Cultivating the field leads to the environment conservation activity maintaining biological diversity.

We also investigate water quality and find out what kind of plankton exist in Shishizuka, and the relation with our farming.

Lake Kasumigaura Session: Panel Discussion

OVERVIEW OF DISCUSSION

Takehiko Fukushima

Director, Ibaraki Kasumigaura Environmental Science Center

“Kasumigaura Session” is held 1) to summarize the present and future states of Lake Kasumigaura, 2) to set the goal images of Lake Kasumigaura in future, and 3) to discuss the concrete measures for leading to the goals. At first, we will discuss and summarize the states and problems of natural and social environments in Lake Kasumigaura based on the presentations by government officers and in the poster session. Next, the goal images of Lake Kasumigaura will be argued with panelists based on the case reports by individual stakeholders. Finally, we shall propose the lists of individual responsibilities and concrete measures necessary for attaining the goals based on the opinions of citizens’ group and young generation as well as the summary reports from the respective satellite sessions. In this session, the ways are discussed to sustainably utilize the blessings of ecosystem services from Lake Kasumigaura.

Lake Kasumigaura Session (Poster)

KP-1 AIMING FOR WATER ENVIRONMENTAL LEARNING WANTED BY PARTICIPANT

Yuki Nagate, Hiroki Nagamine, Yusuke Komatsuzaki, Takashi Fujiwara, Tomoyuki Nakayama, Kazuhiro Mitsuyuki, Masahiro Naito, Kazuhiro Mizuta

Environmental Conservation Section, Civic Life Division, Tsuchiura City

Tsuchiura city regards environmental education as the most important item for fostering attachment to the local through experiencing local history and nature in terms of conservation and succession of rich nature including Kasumigaura, and has provided elementary school students various environmental educations. Other public institutions such as Ibaraki Kasumigaura Environmental Science Center (Ibaraki prefecture) located in Tsuchiura city have carried on events related to environmental education as well. However, due to different PR style from different hosts, it used to be hard for elementary school students and guardians to attain all water environmental events. In order to simplify and improve efficiency of event-related items (gain of publicity, application procedure), Tsuchiura city established systems including unified event information distribution by email for elementary school students (guardians) who would most likely potential event participants, and program called 'Tsuchimaru Eco Kids Club', that the city applies events on behalf of applicants in 2015. This presentation provides program outline and water environment education events which obtained large number of applicants for 3 years.

Keyword: citizen participation, get-close-to-water activities, nurturing environmental sensibility

KP-2 LAKE KASUMIGAURA AS A TOURIST RESOURCE

Motohide Akutsu

Tsuchiura City Office Commerce and Tourism Division

Tsuchiura city is located at the western end of Lake Kasumigaura with the second largest lake area in Japan.

The city has developed as the center of politics, economy and culture in southern Ibaraki Prefecture.

With abundant tourism resources in Suigo-Tsukuba Quasi-National Park, Kasumigaura provides us unique tourism resources in Tsuchiura.

We have been working to create unique sightseeing hub in Kasumigaura with highly added value, together with community space at waterside.

In this paper, we introduce tourism resources unique to Tsuchiura.

Keyword: tourism

KP-3 CITY PROMOTION PROJECTS MAKING USE OF KASUMIGAURA LAKE

Tomoko Muto, Mayumi Sekozawa, Yuichi Iwase

Public Relations Division, Tsuchiura City

Tsuchiura City is located at the western end of Kasumigaura Lake, which has the second largest lake area in Japan, and has been developed as the core city in the south area of Ibaraki Prefecture. The climate in Tsuchiura is relatively mild throughout the year and Tsuchiura is abound with natural environment around Kasumigaura Lake and the foot of Mt. Tsukuba. Tsuchiura City is carrying city promotion projects intending to improve the degree of recognition of the city. These projects emphasize and send out the character of the city by discovering and developing such regional resources. Here we introduce our city promotion projects making use of Kasumigaura Lake, the attractive regional resource closely related to natural environment and history of Tsuchiura City.

Keyword: community building, community revitalization, city promotion

Lake Kasumigaura Session (Poster)

KP-4 EFFORTS TO ENCOURAGE INSTALLATION OF ADVANCED TREATMENT TYPE JOHKASOU

Kouhei Usami¹, Takashi Fujiwara¹, Kazuhiro Mizuta¹, Akira Gorai², Futoru Akiyama²

¹Environmental Conservation Section, Civic Life Division, Tsuchiura City, ²Environmental Sanitation Section, Civic Life Division, Tsuchiura City

Tsuchiura city is located in the west of Lake Kasumigaura and residents here have been using its water for daily life. In mid-1960s, watershed population growth and development of socio-economic activities brought water quality deterioration including offensive odor from the lake, household reduction of fish catch and so on. One of the causes of water pollution is household wastewater and johkasou, which is on-site domestic wastewater treatment system (tank), is one of the measures to treat household wastewater. In 1987, Japanese government started financial assistance for johkasou installation in order to promote countermeasures for domestic wastewater. It is a program that national government and prefectures provide a part of cost to municipalities that carry out financial assistance to those who install johkasou. At that time, Tsuchiura city launched a subsidy program to use it. Now, the city uniquely adds to the amount of assistance of national government and Ibaraki prefecture. Furthermore, the city gives applicants a stricter condition that they have to install certain type of johkasou, which have a higher treatment performance than those nation and Ibaraki prefecture required.

Keyword: Countermeasures for domestic wastewater, Advanced Treatment Type Johkasou, Johkasou Installation Promotion Program

KP-5 EFFECT OF DOMESTIC WASTEWATER COUNTER MEASURES BY TSUCHIURA CITY

Takashi Fujiwara

Environmental Conservation Section, Civic Life Division, Tsuchiura City

Designated as the first priority district of domestic wastewater counter measures in Ibaraki prefecture in 1991, which was based on the Water Pollution Control Law, Tsuchiura city (except former Niihari village district) established 'Tsuchiura City Domestic Wastewater Counter measures Improvement Plan' in March 1992, and 'Tsuchiura City Second Term Domestic Wastewater Counter measures Improvement Plan' in May 2009, and has been initiatively implementing domestic wastewater counter measures by establishing developed infrastructure including sewage system and rural community wastewater treatment activities, and started financial assistance for those who installed *johkasou* that cleared certain level of treatment performance. The result shows that population rate in domestic wastewater processing system decreased from 32.2% (FY1990) to 6.2% (FY2016) for cesspit, from 14.3% to 2.5% for single treatment *johkasou* respectively, and sewage system increased from 35.2% to 81.3%. Four more new rural community wastewater treatment facilities also enhanced to cover 2.8% of them. In spite of 6,414 population growth, BOD load was estimated to decrease 82.7%, from 1888.1kg/day to 326.4kg/day, which shows contribution to improve river water quality in Tsuchiura

Keyword: domestic wastewater counter measures, point and nonpoint source pollution

KP-6 STUDY OF SURVEY ON THE WATER QUALITY OF THE INFLUX CHANNEL OF HOUSEHOLD WASTEWATER INFLOWING THE BIZEN RIVER

Yusuke Komatsuzaki¹, Hiroki Nagamine¹, Takashi Fujiwara¹, Yuki Nagate¹, Tomoyuki Nakayama¹, Kazuhiro Mitsuyuki¹, Masahiro Naito¹, Kazuhiro Mizuta¹, Hirokazu Nakayama²

¹Environmental Conservation Section, Civic Life Division, Tsuchiura City, ²Sewer System Section, Constrution Division, Tsuchiura City

Bizen river is inflowing Lake Kasumigaura, and its watershed was rapidly developed for urban area of Tsuchiura city. The water pollution of Bizen river deteriorated due to the influx of household wastewater accompanying housing land development. Eventually, the BOD recorded 24 mg / L (75th percentile, announced by formerly as known Environment Agency in 1992), which is third height late in Japan at that time. However, current BOD of river is 3.7 mg / L (75th percentile, announced by Ibaraki prefecture in 2016), and the water quality has improved greatly. This improvement of the water quality is suggested to be the result of efforts of people in various positions to improve water quality through "Water Environment Improvement Emergency Action Plan (Limpid stream renaissance 21)" at Bizen river Planned in 1994. In this report, it is investigation of current state that the results of the survey on the water quality of the influx channel inflowing the river conducted at the time of plan formulation.

Keyword: domestic wastewater counter measures, improvement of the water quality

Lake Kasumigaura Session (Poster)

KP-7 EFFORTS OF WORKSPACES AND FACTORIES WASTEWATERS COUNTER MEASURES BY TSUCHIURA CITY

Hiroki Nagamine, Yusuke Komatsuzaki, Takashi Fujiwara, Yuki Nagate, Tomoyuki Nakayama, Kazuhiro Mitsuyuki, Masahiro Naito, Kazuhiro Mizuta

Environmental Conservation Section, Civic Life Division, Tsuchiura City

Tsuchiura city is situated along the western shore of the Lake Kasumigaura(Nishiura) with the second surface area in Japan. And the city has been developed with a blessing from the Lake. Water quality in Lakes was deteriorated sharply with due to economic activation in the 1960s. With regards counter measures for this problem, waste water standards for factories and businesses in the city are determined, which are based on the laws relating to water quality such as Water Pollution Control law, Ibaraki prefectures ordinance, and so on. Since compliance obligation is required by factories and businesses, the prefecture investigates and instructs improvements on status of compliance. This means that the city, positioned as assisting prefecture, has been investigating wastewater of factories and businesses since 1972. This paper shows investigation result by the city.

Keyword: effluent regulation

KP-8 SURVEYS OF RIVER WATER QUALITY FLOWING INTO KASUMIGAURA CONDUCTED BY CITIZENS

Yoshiko Ito, Kiyoshi Miyamoto, Kiyoshi Nakagawa

Council to Improve the Water Quality of Lake Kasumigaura

This project has been carried out in order to 'increase awareness of water purification to those who living at watershed' by surveying water quality of 56-river water flowing into Kasumigaura. This year is marked the 17th. The survey method includes going to local rivers together with citizens and children to observe river condition, filling in the format after observing. Afterwards river water is sampled, carried back to schools, city office or so on in order to measure water quality by the method of simplified inspection. The survey result is analyzed by external expert, summarized as report and handed out to people concerned. In 2016, digest version was published and handed out to those who concerned, participated and so on. This project is carried out by simplified measurement, however, from the view point of changes by year, the percentage of low concentration area has been increasing year by year, which probably brings improving tendency. The cause of pollution still seems to be wastewater from household, agriculture and livestock. Purification of Kasumigaura cannot be achieved only by administration, but by cooperation of residents of watershed. We intend to make continued efforts to improve residents' awareness of water purification of Lake Kasumigaura and inflowing rivers.

Keyword: citizen participation, simplified inspection, awareness raising

KP-9 COUNCIL TO IMPROVE THE WATER QUALITY OF LAKE KASUMIGAURA

Kiyoshi Miyamoto, Yoshiko Ito, Kiyoshi Nakagawa

Council to Improve the Water Quality of Lake Kasumigaura

"Kasumigaura and Kitaura Region Cleaning Campaign" is one of the main projects of our "Council to Improve the Water Quality of Lake Kasumigaura". It has been held twice per year, in spring and summer, since the Council was organized. The campaign was marked the 89th in March this year. Over hundred thousand people, which covers more than 10% of Kasumigaura watershed population (960,000) participate in this campaign every year. In recent years, the number of participants has been increasing, although its growth rate is not as much as before. In the meantime, the amount of collected garbage has been decreasing, which is about half of 10 years ago. The number of project participants is always over 10% of Kasumigaura watershed population which has been increasing in recent years. This fact seems to obtain a deep understanding of residents. Furthermore, it appears that residents' environmental conservation awareness on Kasumigaura has been improving. However, the situation leaves much to be desired. We need to continue implementing this project for environmental conservation of Lake Kasumigaura and rivers. We intend to make efforts that children and residents reminds once again the necessity and importance of water purification of Kasumigaura and rivers, the source of "Water of life", through our project that children and residents visit the lakefront and riverfront and they feel present condition of their surroundings and water quality by their own eyes.

Keyword: Citizen participation, awareness

Lake Kasumigaura Session (Poster)

KP-10 KOISE RIVER EXPEDITION TEAM

Hishiko Kamei, Hiromi Yoshino, Toshio Iitsuka, Kazuyoshi Tagami, Katsuko Furuya, Yoshio Komatsuzaki, Toshio Yabe, Tadanori Hasegawa, Isao Maie, Yoshitaka Akinaga, Hiroki Oginuma, Masanori Hirohara

Liaison Conference of Koise River Expedition Team

Koise River Expedition Team was established in 2003, for the purpose of improving residents' awareness of water purification of the Koise River and the Lake Kasumigaura interconnecting all people living from upstream to downstream the Koise River. The team consists of three municipalities (Ishioka city, Kasumigaura city, Omitama city), environmental citizens groups in the municipalities, and other related public institutions. The team has held 54 events in 15 years, and has been expanding its activities to many people, especially local children. The events include a variety of contents depending on local characteristics, fields of mountain, water, and history, which lead participants to learn local nature and history from various perspectives. The events enhance residents' understanding values of the lakes' water purification and environmental conservation, and local history. Detailed event investigation is needed in order to have more participants in the future. In the watershed of Lake Kasumigaura, there are five expedition team, such as Koise river. They develop their activities and each team hold events unique to itself. Further efforts are required in order for the revitalization of events by developing new activities including to exchange among expedition teams.

Keyword: citizen participation, awareness raising, environmental education

KP-11 BIODIVERSITY ACTIVITIES AT SONOBE RIVER

Shoichi Kato, Isamu Hanyuu, Yui Saito

The Yokohama Rubber Co., Ltd. Ibaraki plant

At the Ibaraki Plant of Yokohama Rubber Co., Ltd., it purifies the water used at the plant and discharges it to the Sonobe River which flows near the factory. The Sonobe River is one of the rivers flowing into Lake Kasumigaura and it is an important source of water for local farmers.

Therefore, we started biodiversity conservation activities from 2013 to analyze quantitatively how factory wastewater affects the Sonobe River. In the activity, we conduct water quality survey of Sonobe River, aquatic life survey, bird survey, vegetation survey and acquire data. From the survey data, it is known that the quality of factory effluent is always superior to that of the Sonobe River and what kinds of organisms inhabit much. We will continue to investigate and accumulate data in the future.

Keyword: Biodiversity, Lake Kasumigaura, Aquatic life, Specified alien species

KP-12 CONSERVATION ACTIVITIES OF WATER SOURCE IN SHISHITUKA SATOYAMA WOODLAND. TUCHIURA CITY, IBARAKI JAPAN

Hiromi Oikawa, Kiyoko Abe, Tosio Kikuti, Tetumi Sasaki, Masato Hukui, Nobuo Morimoto

Certified Non-profit Organization for Nature conservation and history transmission of Shishituka Satoyama

In conservation in the Kasumigaura lake, the citizen's activities of satoyama woodland in the basin is important. In Shishitsuka of Tsuchiura City, Ibaraki Prefecture, there lies a "satoyama" woodland of about 100ha varied terrain surrounding the "Shsituka-Oike" pond, including wetland and grassland thickets, rice paddies and streams, which is home to many creatures. When the neighboring Tsukuba Tenno pond is included, the area doubles 200ha. This is the largest of its kind between Tokyo and the foot of Mt Tsukuba. The area being close to the city, many people can readily enjoy nature and relax. Cultural and historic sites represented by the Nationally Designated Historic Site Kamitakatsu shell mounds are also present, where the wisdom of "satoyama" is handed down to current generations. Since the Shishitsuka nature & history group's inception in 1989, it has been continuously active in conservation of water source the valuable satoyama. Pond conservation Removal of weed lotus, Removal of non-native fish, nowing of walking paths, Shishituka rice ownership, support of yatuda growers, Shishituka rice direct marketing, field cultivation, vegetation management in forest. Shishituka satoyama was a threatened development plans, and in disseminating Japan's SATOYAMA initiative to the world from Shishitsuka.0

Keyword: citizen participation, collaboration, SATOYAMA (community forest) conservation, get-close-to-water activities, nature conservation

Lake Kasumigaura Session (Poster)

KP-13 CITIZEN'S MONITORING AND CONSERVATION ACTIVITIES OF FRESHWATER FISH IN LAKE KASUMIGAURA

Takahiro Morosawa, Tomiji Hagiwara, Masahiro Kumagai

Tsuchiura Nature Conservation Society

We carried out citizen's monitoring using fisherman's set net, field survey of bitterling species and freshwater mussels, ex situ conservation of endangered bitterling species and public awareness activities, to conserve native freshwater fish such as bitterling around Lake Kasumigaura. We start fish monitoring with fisherman from 2006. About 48 species was observed and newly established aliens species was detected at the monitoring. Another monitoring was done around Lake Kasumigaura to monitor bitterling species and freshwater mussels. Native bitterling species gradually decreased recently. On the other hand, freshwater mussel species distributed relatively wide range around Lake Kasumigaura, although some species found at limited area. In these situations, we carried out ex situ conservation of endangered bitterling species at small ponds. Recently, endangered bitterling species successfully increased, so we hand over increased individuals to other citizen groups. These activities and results have been reported through symposiums and publications

Keyword: citizen's monitoring, conservation of freshwater fish, public awareness activities, bitterling, freshwater mussel

KP-14 THE FOUR ALIEN SPECIES, DEEP BODY BITTERLING *ACHEILOGNATHUS MACROPTERUS*, YELLOW CATFISH *PSEUDOBAGRUS FULVIDRACO*, WUCHANG BREAM *MEGALOBrama AMBLYCEPHALA* AND MOSQUITOFISH *GAMBUSIA AFFINIS*, ESTABLISHED IN THE LAKE KASUMIGAURA SYSTEM AFTER 2000, JAPAN

Tomiji Hagiwara¹, Takahiro Morosawa¹, Noriyasu Suzuki², Hiromi Ikezawa³, Tomiko Okui¹

¹Tsuchiura Nature Conservation Society, ²Chiba Biodiversity Center, ³Ibaraki Nature Museum

Results of various fish species introduction from the natural habitat for the fisheries and others, 44 of foreign alien fish and 50 of domestic alien fish were established in Japan. In Lake Kasumigaura, more than 30 of foreign alien fish have been recognized, at least 12 species have been established, and some of these have influenced commercially important fish by changing the ecosystem. We collected deep body bitterling *Acheilognathus macropterus*, yellow catfish *Pseudobagrus fulvidraco*, wuchang bream *Megalobrama amblycephala* and mosquitofish *Gambusia affinis* in the Kasumigaura system after 2000. Reasons of the former three species establishment were irresponsible release of aquarium pet or escape from fish farm and that of the latter was intentional release to channel to control mosquito larvae instead of chemicals use. In this report, at first, we described the detection process, considerable introduce pathway and control policies of four alien fishes. Considering that, continued monitoring of them, attention from stakeholders and early control are necessary for preventing further range expansion.

Keyword: early control, ecosystem, establish, foreign alien fish

KP-15 INFORMATION REGARDING THE PRACTICAL EDUCATION PROJECTS FOR CITIZENS ON KASUMIGAURA LAKE WATER PURIFICATION

Tetsuo Awano, Yasutaka Kashiwamura, Koji Yoshida, Kazuo Ichimura, Yoshiko Ito, Misao Inoue, Toshiharu Kataoka, Toshio Takishita, Kiyoshi Totsuka, Ichiro Nagai, Koichiro Nakagawa, Noboru Hakata, Kazumitsu Harada, Masanori Hirohara, Takehiko Fukushima, Akira Horikoshi, Yoshie Mayama, Kazuhiro Mizuta, Yoko Mimura, Kiyoshi Miyamoto

Executive committee for Kasumigaura Lake's waterfront discovery activities

The source of pollution of the waters in Kasumigaura Lake has different origins. Among them, the release of domestic wastewater is one of the most significant. To solve this problem, raising awareness of every citizens is essential. Since 1998, the executive committee for Kasumigaura Lake's waterfront discovery activities has implemented several projects to directly involve residents and citizens in the purification of Kasumigaura Lake's waters and to raise their consciousness regarding this problem. Past projects include activities such as reed planting, observation of Kasumigaura Lake's fauna and flora, and lakeshore cleaning. By reviewing our results concretely, we are now planning to effectively implement projects to improve our activities.

Keyword: citizens involvement, cooperation, raising awareness, communication, waterfront familiarization

Lake Kasumigaura Session (Poster)

KP-16 BACTERIAL PRODUCTION AND CARBON BUDGET AT THE CENTER OF LAKE KASUMIGAURA, JAPAN

Kenji Tsuchiya, Tomoharu Sano, Noriko Tomioka, Noriko Takamura, Megumi Nakagawa, Ayato Kohzu, Kazuhiro Komatsu, Ryuichiro Shinohara, Akio Imai

National Institute for Environmental Studies

Bacteria play a significant role in materials and energy cycles in aquatic ecosystems. In the present study, we clarified the seasonal variations of bacterial production (BP) in relation to the carbon budget at the center of Lake Kasumigaura from 2012 to 2016. BP was measured by the ^{15}N -deoxyadenosine method and relationships between BP and primary production (PP) were examined. BP varied between $0.01 \text{ gC m}^{-2} \text{ d}^{-1}$ (December) $\sim 0.80 \text{ gC m}^{-2} \text{ d}^{-1}$ (August) and was significantly positively correlated to water temperature. The ratio of BP to PP showed lower values in winter (0.11 ± 0.08) and higher values in autumn (0.22 ± 0.20). Bacterial carbon demand (BCD; BP + bacterial respiration) was estimated to be $0.14 \sim 2.92 \text{ gC m}^{-2} \text{ d}^{-1}$ during the study period. In autumn, the BCD/PP ratio was 0.97, suggesting bacteria should consume organic carbon corresponding to phytoplankton production. On the other hand, the BCD/PP ratio from winter to summer was found to be $0.48 \sim 0.58$, indicating that the organic carbon produced by phytoplankton in the water column was sufficient for BCD.

Keyword: Bacterial production, Lake Kasumigaura, Carbon budget

KP-17 LONG-TERM TRENDS IN POPULATION DENSITIES OF CHIRONOMID LARVAE IN LAKE KASUMIGAURA (LAKE NISHIURA), IBARAKI PREFECTURE, JAPAN

Ryoji Nakazato¹, Ryuhei Ueno², Yuichi Ishii^{3,4}, Koichi Kamiya^{3,5}

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We studied the long-term trends of chironomid larvae in Lake Kasumigaura (Lake Nishiura) from 1982 to 2012 (31 years). The predominance chironomids were four species, *Chironomus plumosus*, *Procladius akamusi*, *Clinotanytus sugiyamai* and *Tanytus nakazatoi*. These population density changed dynamically from 1980s through 2010s. *P. akamusi* larvae which were the most dominant species decreased sharply after 1990, and almost none of the larvae was collected in the 2000s. *T. nakazatoi* larvae increased rapidly after 1995. There was not an intense change in the density of *C. plumosus*. We discussed the alternation mechanism of these dominant species.

Keyword: chironomid larvae

KP-18 WATER QUALITY AND MICROBIAL COMMUNITY IN BOTTOM SEDIMENT CORRESPONDING TO A DEPTH LEVEL IN LAKE KASUMIGAURA

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¹Public Works Research Institute, ²Ministry of Land, Infrastructure, Transport, and Tourism

Dissolution tests were conducted at 30°C under aerobic and anaerobic condition by using sediment from 3 different sampling points in Lake Kasumigaura and microbial community analysis in the bottom sediment was conducted corresponding to a position in a depth direction in order to understand the relevant behavior of materials and lake water quality. In the result of dissolution tests, the behavior of dissolution from bottom sediment was largely different between samples points in the lake. Also, in the results of microbial community analysis, the detection rate of each bacterium was largely changed among samples, especially in the surface of bottom sediment nearby inflowed river. The different of microbial community in the bottom sediment in lake would effect on lake water quality.

Keyword: closed water body, eutrophication, nutrients leached from sediment, microbial community analysis

Lake Kasumigaura Session (Poster)

KP-19 IDENTIFYING SOURCES AND METABOLISM OF NITRATE FROM ANALYSIS OF $\delta^{15}\text{N}$, $\delta^{18}\text{O}$ AND $\Delta^{17}\text{O}$ STABLE ISOTOPE ABUNDANCES IN FOREST AND RICE PADDY WATERSHED AROUND MT. TSUKUBA, JAPAN

Yasuhiro Nakajima^{1,2}, Hikaru Uno¹, Saeko Yada¹, Yuko Itoh³, Masahiro Kobayashi³, Sunao Itahashi^{1,4}, Seiko Yoshikawa¹, Kei Asada¹, Tsuyoshi Horio¹, Keiya Inao¹, Sadao Eguchi¹

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The objective of this study is to identify sources and metabolism of nitrate from analysis of $\delta^{15}\text{N}_{\text{NO}_3}$, $\delta^{18}\text{O}_{\text{NO}_3}$ and $\Delta^{17}\text{O}_{\text{NO}_3}$ stable isotope abundances in forest and rice paddy watershed around Mt. Tsukuba, Japan.

Nitrate in the rain fall and the through fall in the forest watershed had high $\delta^{18}\text{O}_{\text{NO}_3}$ (64.78 - 70.80) and $\Delta^{17}\text{O}_{\text{NO}_3}$ (16.16 - 21.07) values similar to those of nitrate in deposition. These values immediately decreased in the litter layer, soil and mountain stream.

Nitrate in the drainage water in the irrigated rice paddy watershed had high $\delta^{15}\text{N}_{\text{NO}_3}$ (10.50) values compared with that in the forest watershed. $\delta^{18}\text{O}_{\text{NO}_3}$ value shift from hypothetical mixing line was observed especially in the drainage water. This data suggests that ^{18}O enrichment was common in paddy field as a result of denitrification or assimilation.

The research indicates that the triple oxygen and nitrogen isotopes can be used as a powerful tool in order to identify nitrogen sources and metabolism in a forest and agricultural field.

Keyword: denitrification, groundwater, forest, paddy field, nitrogen deposition

KP-20 RECLAMATION OF FORESHORE WITH EFFECTIVE USE OF DREDGED SOIL

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Once there existed various vegetation beginning with emergent plants like common reeds etc. in the lakeshore zone of Lake Kasumigaura, the second largest lake in Japan. However, due to the construction of a lakeshore levee based on the development project of Lake Kasumigaura, which aimed at mitigation of flood damage around the lake and water resource development, part of the vegetation in the lakeshore zone has vanished. Further, the remaining vegetation area has been slightly decreasing even after the completion of the construction work in March of 1996.

To cope with the decrease in the lakeshore vegetation area, Japan Water Agency (hereinafter referred to as "JWA") started to make efforts to restore the lakeshore vegetation zone in 2002 by reclaiming foreshore with the effective use of dredged soil as a lakeshore maintenance material, which was generated by the dredging work implemented as part of our maintenance work. And to this day, natural generation and growth of emergent plants like common reed etc. have been continuing as expected. Furthermore, it was found that the shallows in the artificial foreshore, which was reclaimed in a new attempt, was expectedly effective as a place to grow lakeshore vegetation including submerged vegetation and aquatic organisms.

Keyword: Foreshore, Dredged soil, Effective use, Soil seed bank, Lakeshore vegetation restoration

KP-21 CHANGES IN WATER QUALITY IN LAKE KASUMIGAURA FOUND BY THE MONITORING DATA

Kazuhiro Komatsu, Ayato Kohzu, Shin-ichiro S. Matsuzaki, Megumi Nakagawa, Noriko Tomioka, Ryuhei Ueno, Ryuichiro Shinohara, Kenji Tsuchiya

National Institute for Environmental Studies, Japan

In 1976, a monitoring project was initiated by NIES in Lake Kasumigaura, and marked the 42th anniversary in 2018. In this report, we introduce the changes in water quality in the lake after 2000s. In 2011, massive cyanobacterial blooming was suddenly observed, and the reason for the cyanobacterial blooming has not been clarified until now. We assumed if the blooming is related to the linkage between the ecosystem functions of sediment and the environmental factors in the water column. We would like to introduce the detailed history of the interaction between water column and sediment in Lake Kasumigaura.

Keyword: Lake Kasumigaura, Monitoring, Environmental factors and ecosystem functions, FRRF (Fast Repetition Rate Fluorometry)

Lake Kasumigaura Session (Poster)

KP-22 INFLUENCE OF LIGHT WAVELENGTH AND INTENSITY ON GEOSMIN PRODUCTION OF *STREPTOMYCES COELICOLOR* A3(2)Motoo Utsumi¹, Ayako Kanazawa², Kazuya Shimizu¹, Norio Sugiura¹¹Faculty of Life and Environmental Sciences, University of Tsukuba, ²Graduate school of Life and Environmental Sciences, University of Tsukuba

The occurrence of musty odor concerns originated from microorganisms in freshwater environments has been reported in all over the world. Actinomycetes are known one of the causal microorganisms to produce musty odor substances in fresh water environments. Light is one of the most important factors for metabolic response of actinomycetes. Previous studies have reported that *Streptomyces coelicolor* A3(2) produced carotenoid when exposed at blue light, but didn't produce at red light. Both carotenoid and geosmin are terpenoids. Furthermore, isopentenylpyrophosphate is common precursor of geosmin and carotenoid. In this study, we conducted plate culture experiments under different LED light intensity (0, 1, 10, 20 and 30 $\mu\text{mol m}^{-2} \text{s}^{-1}$) of white, blue (470 nm), green (525 nm), and red (660 nm) light to elucidate the factors that influence on geosmin production. Geosmin production of *S. coelicolor* A3(2) gradually increased under blue and white light condition between 2.5 and 20 $\mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity, but the production tended to decrease above 20 $\mu\text{mol m}^{-2} \text{s}^{-1}$. This result suggested geosmin production of *S. coelicolor* A3(2) increased when exposed short wavelengths light, but decreased at light intensity above specific level.

Keyword: musty odor problem, lake sediment light condition, Actinomycetes, geosmin

KP-23 WATER ENVIRONMENT IN THE SAKURAGAWA RIVER BASIN UNDER THE ADVANCED WATER CIRCULATION MECHANISM OF LAKE KASUMIGAURA, VISUALIZATION OF ACTUAL WATER QUALITY BY MULTIPOINT ELECTRIC CONDUCTION OBSERVATIONShinpei Yoshikawa², Chikako Ohtsuka¹, Masaaki Natsui¹, Chiharu Kumada³, Akihisa Jin¹, Tetsuya Sumi⁴¹Jiyu Gakuen College, ²Graduate school of Daido University, ³University of Taisho, ⁴University of Daido

In the Sakura River basin, agricultural water canal channel is built with Lake Kasumigaura as its water source, and the water is used for irrigation of agricultural land. Drainage from the agricultural land flows out into the river and returns to Kasumigaura again. Water quality and flow rate of river under such water circulation mechanism is expected to be affected by agriculture. In this research, we attempted visualization of water quality by observing electric conductivity which is easy to measure at multiple points in the basin. From the results, we decided to consider the current situation and problems of the water environment in the Sakura River basin.

Keyword: nutrient dynamics, river environment, water circulation mechanism, multipoint electric conductivity observation, Sakuragawa River

KP-24 SEDIMENTARY RECORD OF TSUNAMIS AND FLOODS IN LAKE KASUMIGAURA, JAPAN

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Faculty of Human Sciences, Waseda University

Surface sediment with 75 cm long has been cored at the central part of Lake Kasumi-ga-ura and analyzed grain size in addition to total organic carbon content, total nitrogen content and total sulfur content of each subsamples taken at 1 cm interval. Two wide spread tephra are intercalated in the core, namely, Fuji Hoei tephra erupted in 1707 AD and Asama A tephra erupted in 1783 AD. At the lower most part of the core, shells of *Corbicula japonica* with C-14 ages from 1270 AD to 1298 AD are existed. Many event layers which show grain size maxima and those of total organic carbon content have been recognized. Ages of event layers are estimated using weight sedimentation rate based on ages and depths of two wide spread tephra. Good correlation between ages of grain size maxima and historic Tsunami events and those of total organic carbon and historic flood events are found. Tsunami sediments, so called Tsunamiites, are transported through river Tone from the Pacific Ocean, however, no Tsunamiites are found after the establishment of water gate of river Hitachi in 1960. Flood sediments are supplied from river Tone and/or river Kinu-gawa, those have good correlation to historic flood events observed in Lake Yunoko near Nikko where Kinu-gawa flow from.

Keyword: sediment, tsunami, flood

Lake Kasumigaura Session (Poster)

KP-25 ACTIVITIES AND ROLE OF KASUMIGAURA ACADEMIC CIRCLE - INFORMATION EXCHANGE ABOUT LAKE KASUMIGAURA

Yukimi Yamane

Kasumigaura Academic Circle

Kasumigaura Academic Circle was founded in 1991 by researchers and citizens who were interested in the conservation of Lake Kasumigaura. At that time, big outbreak of water-bloom frequently occurred in the lake, and it became a serious social problem in this area. Then citizens, administrations and researchers made efforts to solve the eutrophication and related problems of the lake. One of the most important purposes of the circle was to offer opportunities of sharing outcomes from each member's research activities, exchanging information and creating views about the conservation and improvement of the lake environment. To realize those, it regularly had symposiums from 1991 to 1995 when the 6th World Lake Conference was held in Ibaraki. It has also published a scientific journal containing many papers dealing with biodiversity and ecosystem, and social aspects of the lake.

After the world conference, Ibaraki Prefectural Kasumigaura Environmental Science Center was founded in 2005, and has functioned as the center of researches mainly for the improvement of lake water quality, and formed a footing for citizen's activities, information exchanges and education in environmental issues. The Kasumigaura Academic Circle's role seems at least partially to be handed over to the function of the center. However, the circle's role will still remain in points, that discussions on problems and exchanges of information from a free and neutral stance are expected, and members' researches will contribute to conserving the biodiversity and ecosystem, as well as solving social problems of the lake.

Keyword: Lake Kasumigaura, environmental information, conservation and improvement, information exchange, environmental education

KP-26 CURRENT STATUS AND ISSUES OF WATER ENVIRONMENT OF SAKURAGAWA RIVER AIM FOR WATER QUALITY IMPROVEMENT

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¹Jiyu Gakuen College, ²University of Taisho, ³Graduate school of Daido University

Rivers are streaming from a mountain and flowing into the sea. Most of Japanese rivers are also the same, and their distinctive lines are a steep slope and the high flow rate. However, Sakuragawa river that flows through the agricultural area of Ibaraki Prefecture has the gentle slope and low flow rate. Also, this river doesn't flow into the sea but flows down into Lake Kasumigaura. The water of Lake Kasumigaura is pumped up and used as agricultural water, drinking water and industrial water at the Southwest part of Ibaraki area. The water, overflowing from the rice fields, runs into Lake Kasumigaura through Sakuragawa River again. This river plays an important role in the circulation system of the water in Ibaraki area.

Although Sakuragawa river was clean about 60 years ago, before Lake Kasumigaura had been damming up to make a reservoir, recently it always shows murky green flow. For taking back to clean Sakuragawa river as same as 60 years back, we conducted the survey of water quality and environmental condition of the river from April 2015 through April 2018. From this survey, we thought the improvement of the disposal of agricultural drainage and conducting activities to induce interest in the river environment toward residents of the basin area play important roles to improve the water quality of Sakuragawa river.

Keyword: water pollution, river environment, field survey, water circulation mechanism, Sakuragawa River

KP-27 CHANGES IN RAINWATER DRAINAGE BURDEN TO NEIGHBORING LAKES BY GROWTH OF TSUKUBA SCIENCE CITY

Ken Nakamura, Donglai Ma, Masaki Fujikawa, Yoshiaki Osawa

University of Tsukuba

In this paper, the relationship between Tsukuba Science City and the surrounding lakes was considered. First, the status of the use of sewage and water in the Tsukuba area was confirmed by document survey. Next, in the influence of urbanization, the transformation of the relation between the city and the lake was grasped from the viewpoint of the trend of population consolidation / center of gravity and the change of land use. In particular, it has been clarified that the load of wastewater loading to Ushiku-numa as a lake of rainwater drainage lake has been increased, and the current situation and issues were stated.

Keyword: Tsukuba Science city, Movement of population center of gravity, Transition of land use

Lake Kasumigaura Session (Poster)

KP-28 BIRDS BELONGING TO THE FAMILY CHARADRIFORMES ON THE SHORE OF LAKE KASUMIGAURA

Tomoharu Nojiri

Sakai Town Office

There are a lot of alluvial lowlands on the shore of Lake Kasumigaura-the second largest lake in Japan. The alluvial lowlands, which are used for lotus fields, rice paddies as well as residences, form the habitat for shorebirds, in particular, birds belonging to the family charadriiformes. 7 species of the family have been observed in the lowlands for 11 years.

Keyword: alluvial lowland, plover, Lake Kasumigaura

KP-29 BIRD NET MANAGEMENT AFFECTS THEIR INVERSION TO THE FIELD AND YIELD LOSS OF LOTUS PRODUCTION IN LATE KASUMIGAURA BASIN

Masakazu Komatsuzaki, Ryosuke Nemoto, Korenari Takahashi

Center for International Field Agriculture Research & Education, Ibaraki University

Lake Kasumigaura is one of the major landing zone for migratory birds. However, bird damages to the lotus production is one of the very serious concerns for farmer in Lake Kasumigaura basin. Some of farmers covers the lotus field by a bird net to avoid the yield loss of lotus production due to pecking, however, many birds were killed by the net in the lotus fields. This research was investigated the effects of bird net managements on bird inversion to the field and yield loss of lotus production. The result revealed that the field where covered on all side and the roof by the net completely, showed little bird inversion and minimized yield loss of lotus. On the other hand, no net management field were inverted many bird and 3.5% of yield loss of lotus due to pecking.

Keyword: Lotus, waterbird, Bird conservation

KP-30 DAMAGE TO WILD BIRDS CAUSED BY NETS ON LOTUS LOTUS FIELDS. ~THE REASON WHY LAKE KASUMIGAURA CANNOT BECOME A RAMSAR SITE~Machiko Kanazawa¹, Shinichi Ebihara¹, Kayoko Takahashi²¹Wild Bird Society of Japan, ²Non-profit Organization for Conserving the KONDADAI Ecocistem

Lake Kasumigaura is one of major habitats of aquatic birds in Japan. In spite of that, the surrounding lotus fields hasuda are now covered with anti-bird nets. Since 2004, using prefectural subsidies, anti-bird netting has been set up on the lotus fields around Kasumigaura in order to protect them from wild birds. Wild birds - mostly aquatic birds but also rare species such as birds of prey - die because of the nets. According to the data from Wild Bird Society of Ibaraki, in the 5 years from 2014 to 2018 more than 7000 birds lost their life in the nets. We conducted a photographic survey to assess the current situation. We found out that the management of the nets by lotus root farmers is still insufficient and the situation has not improved. Some nets that were past their service life have been removed, but this did not lead to the reduction of damage to the birds, which continue to lose their life in the nets. Children on their way to school walk past the fields with ducks tangled in nets, struggling for their life. We believe that it's important for humans to coexist with wild birds and share the blessings of nature. Our aim is to use photographic and other evidence to gain wide recognition of this serious issue and to call for measures to solve it, and eventually achieve protected status by registration of the site under Ramsar Convention.

Keyword: Kasumigaura, Prevention bird net, Ramsar, renkon, caused by nets

Lake Kasumigaura Session (Poster)

KP-31 THE PER CAPITA RUNOFF CHANGE ANALYSIS IN A WATERSHED-AN EXAMPLE OF LAKE KASUMIGAURA BASIN

Ma Donglai, Ken Nakamura, Yoshiaki Ohsawa

University of Tsukuba

This research took Lake Kasumigaura Basin as an example and discussed the effect of land use/cover changes (LUCC) on per capita runoff change through the spatial analysis. The results showed that: 1) Land Use/Cover types have changed enormously in Lake Kasumigaura Basin in the past 40 years; 2) LUCC influenced the runoff change which can be described by the increase of comprehensive runoff coefficient from the year 1976 to 2014; 3) Per capita runoff kept stability, but people would share more rainwater runoff in the future.

Keyword: land use/cover changes, comprehensive runoff coefficient, per capita runoff, Lake Kasumigaura Basin

KP-32 LONG-TERM TREND OF CHIRONOMID LARVAE IN LAKE KITaura

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From 1999 to 2016, we investigated the changes in species composition and larval density of chironomid in Lake Kitaura. As a result, the dominant chironomid species in muddy sediment areas of this lake were *Chironomus plumosus*, *Procladius akamusi*, *Tanytarsus nakazato* and *Clinotanytarsus sugiyamai*. In the long-term trend of the larval density in the profundal zone of this lake (depth of about 6.5 m), the density of *Chironomus plumosus* did not change significantly. *Procladius akamusi* was not collected nearly between 2001 and 2007, but the number of individuals recovered after 2008. *Tanytarsus nakazato* and *Clinotanytarsus sugiyamai* have been rarely collected in Lake center since 2008. Long-term trend of larval density in Lake Kitaura and factors of its change were discussed.

Keyword: Lake Kitaura, zoobenthos, chironomid larva, long-term trend

KP-33 EFFECTS OF LANDUSE AND LIVESTOCK-RELATED FACILITIES ON GROUNDWATER NITRATE CONCENTRATION IN HOKOTA REGION

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⁵Western Region Agricultural Research Center, NARO

Effects of landuse and livestock-related activities on groundwater nitrate concentration was investigated in an intensive vegetable and livestock production area, Hokota region, located at northeastern part of the Kasumigaura Basin. Groundwater nitrate concentration was determined for the 70 wells in 2014-2017. QGIS was used for aerial photograph-based geospatial analyses to calculate different landuse areas and to identify livestock shed's roof areas and places of composted manure storage. These geospatial data in the surrounding area of each well with different radii were used as dependent variables to elucidate the groundwater nitrate concentration distribution by multiple regression analyses based on Akaike's Information Criteria (AIC). Moreover, the geospatial analyses for the neighboring zone of each composted manure storage with different radii were conducted separately from the other zone, assuming that more composted manure is applied to the neighboring zone. Consequently, the best regression model was obtained when the radius from the wells was 500 m and that from the manure storages was 150 m, indicating that such geospatial analyses combined with multiple regression models can be used to estimate not only the effects of landuse and livestock-related activities but also the influential areas on regional groundwater nitrate concentration distribution. The areal fraction of paddy field was selected as an independent variable with a negative regression coefficient, suggesting that the percolating water from paddy fields is effective to reduce groundwater pollution by nitrate in this region.

Keyword: Geographical Information System

Lake Kasumigaura Session (Poster)

KP-34 HOW MUCH INFORMATION ABOUT LAKE KASUMIGAURA CAN WE OBTAIN USING A WEB APPLICATION OF CLIMATES OF GLOBAL LAKE BASINS: CGLB?

Tosiyuki Nakaegawa

Meteorological Research Institute

We investigated how much information about Lake Kasumigaura we can obtain through a web application as a global lake database: Climates of Global Lake basins or CGLB developed by Nakaegawa et al. (Development of a web application for examining climate data of global lake basins: CGLB. Hydrological Research Letters, 9(4), 125-132, 2015). One can obtain the following limnological features of Lake Kasumigaura: areas of surface water and lake basin, length of coastal line, mean and maximum depths. There are links to information about meteorological variables on ClimatView developed by Japan Meteorological Agency and information about water level by US Department of Agriculture. CGLB also provides on-demand functions for drawing figures of geographical distribution of the meteorological variables in a user-specific area and of time-series of them at a point of interest. Therefore, one can obtain basic information about Lake Kasumigaura through CGLB when he/she starts a study about Lake Kasumigaura.

Keyword: Climates of global Lake Basins, global, lake basin, climate, database

KP-35 PROVISION OF GEOSPATIAL INFORMATION CONTRIBUTING TO VARIOUS EFFORTS FOR MANAGING LAKE KASUMIGAURA

Masami Nemoto, Yoshinori Numata, Yasuyuki Inazawa, Yoshinori Shinomiya, Ryosuke Hayashi

Geospatial Information Authority of Japan, Ministry of Land, Infrastructure, Transport and Tourism

Geospatial Information Authority of Japan (GSI) provides various kind of geospatial information relating to Lake Kasumigaura including the Lake Datasets (Kasumigaura). By utilizing such geospatial information, the efforts for environmental protection, restoration and nature symbiosis of Lake Kasumigaura promoted by relevant organs including the national and local government can be conducted in a precise, quantitative and visible way. GSI would like to contribute to promoting such effort through the provision of valuable geospatial information.

Keyword: the Lake Datasets, numeric data, lake image data

TS1-1 NATIVE JAPANESE STRAIN OF THE COMMON CARP (*CYPRINUS CARPIO*): A PRECIOUS NATURAL HERITAGE REMAINING IN LAKE BIWA



Kohji Mabuchi

Lake Biwa Branch Office, National Institute for Environmental Studies

Wild common carp (*Cyprinus carpio*) are suffering worldwide because of the invasion of conspecific domesticated strains, and the native Japanese strain is no exception. A survey of mitochondrial (mt) DNA sequences from 11 localities in Japan revealed that roughly half of the haplotypes found at all 11 localities were those of introduced Eurasian strains, indicating that the native Japanese strain is suffering as a result of the invasion of Eurasian strains. However, an intensive mtDNA survey of the Lake Biwa population, the largest freshwater body in Japan, demonstrated that about 80% of the individuals in its deep off-shore waters (30-70 m depths) had native Japanese haplotypes. Moreover, a population genetic analysis of nuclear single nucleotide polymorphisms (SNPs) revealed that Lake Biwa harbored a relatively pure native population in its deep waters.

Morphological analyses of the Lake Biwa and introduced Eurasian carp using genetic hybrid indices based on the SNPs showed that the typical native Japanese carp surviving in the lake differed from the introduced Eurasian carp in a body-shape trait, some internal features, and some meristic and morphometric characters used for carp taxonomy. A metadata comparison of the last characters between the native Japanese and native Eurasian carp indicated that the native Japanese carp deserves at least subspecific status. In addition, the native Japanese strain was located in a relatively basal position in the molecular phylogenetic tree of the common carp. Therefore, the native Japanese strain surviving in Lake Biwa has world conservation priority, to preserve genetic and taxonomic diversity of the species.

Keyword: Lake Biwa, common carp, native Japanese strain, subspecies

Curriculum Vitae

Researcher, Lake Biwa Branch Office, National Institute for Environmental Studies since April 2017 after holding academic posts such as Assistant Professor, Atmosphere and Ocean Research Institute, the University of Tokyo

Technical Session 1: Biodiversity and Biological Resources Invited Lecture**TS1-2 CURRENT STATUS AND FUTURE RESEARCH OF
BIODIVERSITY ASSESSMENT AND ECOSYSTEM
CONSERVATION IN JAPANESE LAKES**

Noriko Takamura, Shin-ichiro S. Matsuzaki

National Institute for Environmental Studies

In Japan's lakes, compared with before 2000 and after 2001, it was shown that about 28% of strictly freshwater fish species and about 57% of aquatic vascular plant species have disappeared (Matsuzaki et al. 2016; Nishihiro et al. 2014). This decrease in the number (or richness) of emerging species can be regarded as one important signal indicating the current state of biodiversity deterioration of Japanese lakes. Further, Matsuzaki & Kadoya (2015) estimates of catch per unit effort (CPUE) of fishery resources revealed that the CPUEs declined in most lakes, and the functional group richness of exotic piscivores was the most important predictor of changes in the CPUE among several drivers (based on the long-term data on the annual catch, fishing effort, and fishing power of 23 Japanese lakes dating back to the 1950s). This suggests a substantial decline in ecosystem services.

To mitigate further degradation of biodiversity and ecosystem services, and to continue to enjoy the benefits of freshwater areas and their adjacent ecosystems, we have started analyzing the relationships among multiple ecosystem services in the Lake Kasumigaura Basin. Our dataset includes biological monitoring of plankton and benthos in Lake Kasumigaura accumulated for about 40 years along with the water quality monitoring since the 1970s (e.g., Takamura and Nakagawa 2012). This research seeks to make use of such long-term data for evaluation and conservation of biodiversity and ecosystems, in addition to developing new monitoring methods and tools (e.g., environmental DNA).

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Matsuzaki SS, Kadoya T 2015 *Ecological Applications* 25, 1420-1432.

Takamura N and Nakagawa M 2012 *Ecological Research* 27, 837.

Curriculum Vitae

May 1979: Researcher, National Institute for Environmental Pollution Research, Environment Agency
 January 1994: Head, National Institute for Environmental Pollution Research, Environment Agency
 April 2011: Director, National Institute for Environmental Studies
 April 2015: Fellow, National Institute for Environmental Studies

Technical Session 1: Biodiversity and Biological Resources Section 1: Biodiversity 1

O1-1 VERTICAL DISTRIBUTION OF PHYTOPLANKTON AND THEIR RELATIONSHIP WITH WATER QUALITY IN MAE KUANG RESERVOIR, CHIANG MAI, THAILAND

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This study aims to investigate the vertical distribution of phytoplankton and their relationship with the water quality in Mae Kuang Reservoir, the large important irrigation and water supply in Chiang Mai-Lamphun Basin. The sampling was carried out from 2014-2015. Every five meters deep from surface were investigated at deepest point of the reservoir. The samples were collected in summer, rainy and cool-dry seasons. One hundred and one species of phytoplankton in 37 genera and 6 divisions were found. The highest number of phytoplankton species were found in Division Chlorophyta (56 species) followed by Division Euglenophyta (17 species) Division Cyanophyta (11 species) Division Chrysophyta (6 species), Division Bacillariophyta (6 species) and Division Pyrrophyta (5 species) respectively. The dominant species were *Cosmarium* sp., *Staurodesmus* sp., *Staurastrum limneticum* Schmidle, *Pseudanabaena* sp. and *Trachelmonas acanthostoma* Stokes. The overall water quality of Mae Kuang Reservoir was classified to the level 2nd when compared to the standard surface water of Thailand. It means that the water was appropriated to using for household consumption by passing the standard treatment.

Keyword: Vertical distribution, Phytoplankton, Water quality, Mae Kuang Reservoir

O1-2 RELATIONSHIP BETWEEN PHYTOPLANKTON COMMUNITY STRUCTURE AND WATER QUALITY IN THE LAKE GOLD COAST, NORTH JAKARTA

Aliati Iswantari, Inna Puspa Ayu, Niken Tunjung Murti Pratiwi, Sigid Hariyadi, Vina Nursyarah

Bogor Agricultural University

The input of organic materials into aquatic environment has potential to become nutrients that could be utilized by phytoplankton. Nutrient utilization by phytoplankton may affect plankton community structure in environment. This study aimed to determine the relationship between phytoplankton community structure and water quality in the Lake Gold Coast. This study was conducted from January to December 2016 in five observation sites. Physical water quality parameters (depth, transparency, turbidity, temperature, pH, salinity, and dissolved oxygen, chemical parameters (ammonia, nitrite, nitrate, and orthophosphate) and biological parameters (phytoplankton) was analyzed. Group of phytoplankton found were Bacillariophyceae, Chlorophyceae, Cyanophyceae, and Euglenophyceae. Bacillariophyceae has the highest abundance during observations. Based on water quality, there were three groups of site. This grouping was used to conduct the further analysis. PCA analysis result showed that phytoplankton abundance was in close position to orthophosphate. This was strengthened by Pearson correlation test that showed high correlation between abundance of phytoplankton with orthophosphate.

Keyword: artificial lake, Lake Gold Coast, microalgae, nutrient, water quality

O1-3 LITTORAL PHYTOPLANKTON COMMUNITY IN LAKE LANAO, MARAWI CITY, PHILIPPINES

Husna Abdullah Dimapalao

Mindanao State University

Being an effective biological indicator, phytoplankton diversity can determine productivity of and physicochemical status of any bodies of water. This study was performed to explore the diversity of phytoplankton in the littoral zone of Lake Lanao along Marawi city, LDS, Philippines. Freshwater samples were collected on the months of November 2016 and February 2017 following oblique towing using a planktonet with a mesh size of 23 microns. A total of 27 species, including one unidentified, representing 24 genera belonging to the divisions Bacillariophyta, Chlorophyta, Cyanophyta, Charophyta, and Dinophyta were recorded. The identified genera are as follows: *Anabaena*, *Ankistrodesmus*, *Coelosphaerum*, *Coscinodiscus*, *Cyclotella*, *Cymbella*, *Cylindrocapsa*, *Diatoma*, *Dictyosphaerum*, *Eudorina*, *Golenkinia*, *Lyngbya*, *Melosira*, *Microcystis*, *Navicula*, *Nitzschia*, *Oedogonium*, *Pandorina*, *Peridinium*, *Rhizosolenia*, *Rhopalodia*, *Staurastrum*, *Synedra* and an unidentified genus. Result showed that the unidentified species was the most abundant with relative abundance of 71.58% and 64.27% and the Shannon's Index of Diversity was 0.99 and 1.06 for the November 2016 and February 2017 samples, respectively.

Keyword: Lake Lanao, Marawi City, Phytoplankton community

Technical Session 1: Biodiversity and Biological Resources Section 1: Biodiversity 1

O1-4 THE TYPOLOGY AND TAXONOMIC DIVERSITY OF THE ABKHAZIA REPUBLIC LAKES AND RIVERS (CAUCASUS)

Nafisa Mingazova¹, Dina Mingazova², Roman Dbar³, Venera Ivanova¹, Irshat Shigapov¹, Olga Palagushkina¹, Olga Derevenskaya¹, Elvira Nabeeva¹, Elina Kilmamatova¹, Nail Nazarov¹, Lyuba Pavlova¹, Aigul Galiullina¹, Rinat Mingaliev¹, Julia Mayatina¹, Julia Badretdinova¹, Fairouza Valiullina¹

¹Kazan (Volga region) Federal University, ²Melbourne Royal University of Technology, Australia, ³Institute of Ecology of the Academy of Sciences, Abkhazia

The Republic of Abkhazia (the Western Caucasus) has a significant number of water objects - plains and mountain lakes and rivers. Many of them are associated with karst processes and caves. According to the inventory, 28 flat lakes and at least 70 lakes of mountain origin are identified. Lakes are very different on genesis, area, depth, water regime, mineralization and composition of hydrobionts. The largest lakes in the plain are lakes Inkit (40 ha), Skurcha (140 ha), Bibisiri (76 ha), Sukhumskoe (27 ha) and a lake near Ochamchira city (74 ha). The most famous mountain lakes are Lake Big Ritsa (127 ha) and Small Ritsa (10 ha) of the National Ritsinsky Park, as well as Amtkel Lake (58 ha) and Mzi Lake (15 ha). Researches of the Kazan Federal University (Russia) and the Institute of Ecology of the Academy of Sciences of Abkhazia in 2007-2017 revealed the typology and biodiversity of river and lakes, rare and endemic species. Thus the diversity of types of water bodies causes a high biodiversity of lakes and rivers of Abkhazia.

Keyword: lakes, rivers, Caucasus, Abkhazia, phytoplankton, zooplankton, zoobenthos, typology, biodiversity

Technical Session 1: Biodiversity and Biological Resources Section 2: Biodiversity 2

O1-5 DNA BARCODING REVEAL THE CURRENT STATUS UNEVALUATED SPECIES OF *RASBORA SP* (CYPRINIDAE) FROM BERATAN LAKE, BALI

Gde Raka Kartika Kartika, Pande Gde Sasmita Julyantoro

Udayana University, Bali

One of the fish species that is a living resource found in Beratan lake is *Rasbora sp*. *Rasbora sp* contained in Beratan lake has unique characteristics that have not been much studied yet either morphometric or genetic. DNA barcoding can be used to determine the status of *Rasbora sp* contained in Beratan lake. From the results of the research, it is known that *Rasbora sp* species in Beratan lake is a complex species that cannot be clearly identified because the species is identical to the species *Rasbora lateristriata* and *Rasbora baliensis* based on barcoding DNA. The grouping of *Rasbora* species based on their living areas also occurs due to geographic isolation such as waters, thus affecting the genetic diversity of *Rasbora sp* into low. In addition, data on conservation status, population trends, and trade status of *Rasbora lateristriata* and *Rasbora baliensis* species are not available adequately. This data is important for the management of the species on *Rasbora sp* found in Beratan lake.

Keyword: biodiversity evaluation, endangered species, DNA Barcoding, *Rasbora sp*, Beratan Lake

O1-6 DEVELOPMENT OF SPECIFIC MARKERS FOR MONITORING DISTRIBUTION OF SPOTTED BARB (*BARBODES BINOTATUS*) USING EDNA ANALYSIS

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Indonesia has numerous lakes and rivers inhabited by many native and endemic fishes. It has been reported that many of Indonesian native fishes are declining because of overexploitation, habitat degradation, and pollution. Better management and conservation of Indonesian fish resources are needed for the sustainable utilization of the fishes. However, long term monitoring using traditional methods is time consuming and laborious. Currently, the environmental DNA (eDNA) approaches have been proposed as alternative tools to detect and monitor species in aquatic ecosystems. Primer design and test is an important step when targeting a particular species. The study aimed to develop specific primers for monitoring distribution of spotted barb in of Lake Maninjau and Lake Toba using eDNA approach. In this study, the design primers were tested in silico and in vitro. Our designed primer seemed to be specific for *B. binotatus* from Lake Maninjau and Lake Toba. However, further test should be conducted to increase the specificity of the primers. Moreover, newly designed primers will be developed from another segment of mitochondrial DNA.

Keyword: Biodiversity evaluation, eDNA, spotted barb, fish distribution

Technical Session 1: Biodiversity and Biological Resources Section 3: Biodiversity 3**O1-7 PREDICTING CLIMATE CHANGE IMPACT ON ZOOPLANKTON COMMUNITY STRUCTURE BASED ON THERMALLY POLLUTED LAKES**

Marcin Dziuba, Lukasz Wejnerowski, Witold Szczucinski, Slawek Cerbin

Adam Mickiewicz University in Poznan

Thermal pollution of freshwater basins is an increasing problem related to power plants activity. Change in thermal regime of lakes can have far-reaching negative consequences as a source of environmental disturbance, posing a risk of local extinctions and supporting establishment of invasive species. On the other hand, heated lakes and reservoirs can be used as a large scale experiment for testing global warming related predictions. In order to address the question, how increased temperature will impact genetic diversity and structure of local community, we used a system of five lakes heated by lignite combusting power plant in Poland. Due to warm water discharge these lakes are ca. 3-4° C warmer than non-heated control lakes nearby. We checked how five decades of temperature elevation affected genetic diversity of *Daphnia* community, and compared genetic structure of *Daphnia* community inhabiting heated lakes with control lakes community. Furthermore, we genotyped resting eggs extracted from sediments, produced by *Daphnia* in heated lake before warm water discharge and afterwards, to check how the community changed through the time after temperature elevation. Collected data provide an evidence for significant impact of thermal regime on structure and genetic diversity of local *Daphnia* community. Adaptation to climate warming will likely induce such changes in lake communities worldwide, as they might be inevitable for community functioning in new environmental conditions.

Research funded by Polish National Science Centre, project no. 2015/17/N/NZ8/01570

Keyword: biodiversity evaluation, effects of climate change

O1-8 ZOOPLANKTON ABUNDANCE AND BIOMASS SIZE SPECTRA IN SHALLOW URBAN LAKES: ANALYSIS USING LASER OPTICAL PLANKTON COUNTERReliana Lumban Toruan^{1,2}, Anas Ghadouani¹, Elke S Reichwaldt³

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A laser optical plankton counter was used to examine zooplankton size structure in seven urban lakes across the Swan Coastal Plain (SCP), Western Australia. Based on the zooplankton abundance and biomass of equivalent spherical diameter ESD in 32 bins for every 0.1 mm between 0.3 and 2.5 mm, zooplankton normalised biomass size spectra (nbss) were constructed to display community structure. Nbss parameters slope and intercepts, were used to classify the zooplankton community size spectra. Zooplankton size distribution varies across the lakes. Based the LOPC measurement, small-sized zooplankton (<1.0 mm ESD) was dominant in most lakes which contributed to >50% of the total abundance. However, contribution of large-sized zooplankton (1 - 2.5 mm ESD) toward total biomass was significant in Lake Yangebup, Little Rush, Bibra and Herdsman Lake. Small-sized zooplankton (0.3-1.0 mm ESD) biomass, on the other hand, was evident in Lake Monger, Joondalup and Yonderup. Using the nbss parameters such as slope and intercept, a Bray-Curtis cluster analysis classified the zooplankton communities into three groups. Group with a lower slope was observed only for Lake Yonderup (slope = -0.471) which indicates the dominance of small-sized zooplankton. Lower slope were caused by the dominant of small copepod (0.5-1.0 mm ESD) which contribute to >80% of the total biomass. Group 2 and group 3 have a steeper slope closer to the theoretical value of -1 which indicate a significant contribution of large-sized zooplankton toward total biomass. >50% of the total biomass was constructed by larger-sized zooplankton (1.0-2.5mm ESD) for this group.

Keyword: Zooplankton size spectra, urban lakes, laser optical plankton counter, Nbss

O1-9 ZOOPLANKTON IN ASSESSING OF THE WATER QUALITY IN URBAN AREAS

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Kazan Federal University

The results of studying the zooplankton communities of various water bodies located in the urbanized areas of the Middle Volga Region (Russia) are presented. The aim of the research was to assess biodiversity, characterize the structure of zooplankton communities and identify the factors that have the greatest impact on zooplankton. The studied reservoirs were divided into 4 groups: lakes located in floodplains of rivers and urban forest parks; small shallow-water lakes in residential micro-districts; ponds located on rivers flowing through the city and careers on rivers; small shallow-water lakes where rehabilitation measures were carried out. As a result of the studies, 180 species of zooplankton were identified. The greatest number of species was in lakes located in parks and in residential areas. It has been established that in urbanized areas, pollution and eutrophication processes have the greatest negative impact on zooplankton communities. Negative correlations of quantitative indices of taxonomic groups of zooplankton with water content of copper, iron, manganese, lead, zinc, permanganate oxidation were revealed.

Keyword: biodiversity evaluation, biological resource use, water pollution, water quality, ecosystem functions

01-10 ZOOPLANKTON COMMUNITIES IN LAKE NASSER UNDER CURRENT FLOOD REGIME BEFORE THE IMPLICATIONS OF GRAND ETHIOPIAN RENAISSANCE DAM (GERD) CONSTRUCTION

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Lake Nasser is a subtropical monomictic, mesotrophic lake and it is the main Nile water reservoir in Egypt. The Nile flood comes once a year in late August and has a direct effect on the Lake ecosystem. This study investigates and documents the effect of Nile flood (the current regime) on zooplankton communities in Lake Nasser as a large artificial water body before filling of Grand Ethiopian Renaissance Dam (GERD). Zooplankton sampling was performed during flood (August 2016), post-flood (December 2016) and pre-flood (May 2017). Five sectors were selected as sampling locations covering the whole lake. zooplankton populations at the studied area composed of four main groups, *Copepoda*, *Cladocera*, *Rotifera* and *Protozoa* in addition to *meroplankton*. The standing crop of the total zooplankton was higher during flood season with an average density of 117803 Org. m⁻³, while it decreased to more than the half during post-flood and pre-flood seasons with averages densities of 31602 and 31828, respectively. The study concluded that, flood is an important factor that affects zooplankton composition and density in Lake Nasser and any future change in flood regime will have its impact on zooplankton communities in Lake Nasser.

Keyword: biodiversity evaluation

Technical Session 1: Biodiversity and Biological Resources Section 4: Ecosystem Services**O1-11 STATUS OF SOME WETLANDS FROM SOUTH WESTERN MAHARASHTRA-INDIA WITH SPECIAL REFERENCE TO FLORISTIC AND AVIAN DIVERSITY, ECOSYSTEM BENEFITS, THREATS AND MANAGEMENT STRATEGIES**

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India has a wealth of wetland ecosystems that support unique habitats with large diversity of biota representing almost all taxonomic groups. As per the National Wetland Atlas 2011, India has about 757.06 thousand wetlands with a total wetland area of 15.3 m ha, accounting for nearly 4.7% of the total geographical area of the country. Out of these, only 26 wetlands have been designated as Ramsar Sites (Ramsar, 2013). Upon recognizing the ecological significance of the wetland habitats, an extensive and intensive survey was undertaken during 2012-2016 to document floristic and avian diversity of 20 wetlands from South Western Maharashtra. The floristic diversity study revealed that about 263 plant species belonging to 210 genera of 63 families were recorded from the study area. Of these 263 species, 191 are dicotyledons belonging to 162 genera of 51 families and 72 species are monocotyledons belonging to 48 genera of 12 families. About 180 species of birds belonging to 15 orders and 45 families were recorded, of those 138 are terrestrial birds and 42 species of aquatic birds were observed. Out of 180 birds, 113 residential, 42 residential migratory and 25 are migratory. To highlight the environmental and geographical significance mapping of these 20 wetlands have been completed with the help of GPS. This paper reviews the wetland wealth of South Western Maharashtra, India in terms of floristic and avian diversity, their geographic distribution and ecosystem benefits. The paper also discusses threats, priority area and management strategies for conservation of these fragile ecosystems.

Keyword: Wetlands, South Western Maharashtra-India, Floristic and Avian Diversity, Ecosystem benefits, Management strategies

O1-12 FISHERMAN'S WILLINGNESS TO PAY FOR SUSTAINABLE ECOSYSTEM MANAGEMENT OF JAFFNA LAGOON

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The economy of the fishing community along the Jaffna lagoon is heavily dependent on fishing activities, but overfishing and overexploitation of lagoon ecosystem is a significant challenge for the Sri Lankan government to support sustainable lagoon ecosystem. The purpose of this study is to analyze the fisherman choices, preferences and willingness to pay for different sustainable lagoon ecosystem management practices. Choice modeling approach was used to estimate the willingness to pay different lagoon ecosystem management. Along the lagoon, 65 fishermen from four densely populated town fishing communities and 53 fishermen from two less densely populated village fishing communities are randomly selected for this survey. Conditional logit model was estimated for the selection of choices of fishing communities. Results show that fishermen from town communities are willing to pay for less for increase the number of mangroves and develop the tourist facilities when compared to village fishing communities as there are high competitions for land along the lagoon shore in town for fishing activities, anchoring fishing boats and housing. As fishing is the major source of income for both communities, they are not willing to support for banning inappropriate fishing gears. Establishing fishing harbour facilities, properly planned multistory housing units, increasing the awareness of negative impact of inappropriate fishing gears and developing alternative sources of income for fishermen would increase their support for the sustainable lagoon ecosystem management.

Keyword: ecosystem Management

O1-13 CAN SCIENTIFIC EVIDENCE TO DEPICT THE ECOSYSTEM SERVICES EFFECTIVELY RESOLVE THE CONFLICT BETWEEN THE PROTECTED AREA MANAGERS AND THE LOCAL DEPENDENT COMMUNITY? NALABANA BIRD SANCTUARY; CHILIKA LAKE A WETLAND OF INTERNATIONAL IMPORTANCE, INDIA; A CASE STUDY

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Chilika Lake is the most significant coastal wetland along the east coast of India and a Ramsar site. The highly productive lake ecosystem with its rich fishery resources sustains the livelihood of more than 0.2 million fishers. Chilika is a vital wintering ground for the migratory bird of Asiatic subcontinent. Nalabana island within the lake, spread over 15.53 sq. Km, designated as a bird sanctuary in 1973. Nalabana was known for highly productive capture fishing ground till 1973. The ban on fishing clamped after notification led to conflict between the local fishers and the protected area managers. Interestingly, after the designation of protected area the fishers have been getting a good harvest from the trap they lay outside the sanctuary boundary. However, the ecosystem services, contributed by the sanctuary quietly has been gone unnoticed by the local fishers. For the ecosystem service paradigm to be relevant to resource-dependent communities, it is essential to generate awareness and their perception of it. The study carried out during July 2011 to June 2014, by the authors, attempted to establish through scientific evidence, the ecosystem services provided by the sanctuary in the form of potential nursery and spawning ground for fish. The outcome of the study conclusively demonstrated that sanctuary is serving as feeding and nursery for 45 species of fish and spawning of 11 resident species, contributing significantly to the lake fishery. The outcome of the study changed the perception of local fishers about the sanctuary and ecosystem services it provides, also in resolving longstanding conflict.

Keyword: ecosystem services, lake ecosystem, protected area, scientific evidence, spawning

O1-14 ECONOMIC EVALUATION OF ECOSYSTEM SERVICES OF LAKE KASUMIGAURA AND ISSUES WITH THE EVALUATION METHOD

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The authors examined the content of ecosystem services of Lake Kasumigaura and calculated economic value by using replacement cost method and conjoint analysis. As a result, when applying the replacement cost method, the economic cost / benefit of provisioning services and regulating services were large, flood control was the largest among them. On the other hand, the economic cost / benefit of supporting services were unable to be calculated. It is clear that water quality improvement is regarded as the most important by conjoint analysis. However, there were issues, such as the necessity of calculation of value considering trade-off between water pollution and ecosystem, and double accounting for provisioning services and cultural services. It was also suggested that there may be additional cost/benefits that could be evaluated apart from those aspects evaluated here. From now on, while trying to solve these problems, this author would like to use the factors identified here as a basis for stakeholder discussion, such as "what should be Kasumigaura."

Keyword: ecosystem services, replacement cost method, conjoint analysis

Technical Session 1: Biodiversity and Biological Resources Section 5: Biodiversity 4**O1-15 TERMINALIA ARJUNA AS A RIPARIAN SPECIES TO THE PROTECTION ALONG THE LAKE, TANK AND CATCHMENT AREAS IN SRI LANKA**D.L.Y Amarasinghe¹, D.A.B.N Amarasekera², T Sivananthawerl³, K.T Premakantha⁴

¹Department of crop science, Faculty of Agriculture, University of Ruhuna, ²Department of crop science, Faculty of Agriculture, University of Ruhuna, ³Department of Crop Science, University of Peradeniya, ⁴Regional Deputy Conservator of Forests Office (North Western province/Western Province)

Terminalia arjuna is a characteristic component of dry evergreen forests in Sri Lanka which helps to control erosion, acts as a natural bio filter and protects wet land areas. The current field-based approaches for estimation of volume in tree species are laborious and expensive process due to destructive harvesting of more trees. Therefore to protect riparian species, we require accurate, flexible and valid common equation to do predictions of volume estimation. This research mainly focuses on evaluation of volume of *Terminalia arjuna* in order to make suitable decisions regarding biodiversity and biological resource services in riparian areas.

For the current study, the secondary data was taken from Moragahakanda area in Sri Lanka. 400 observation for *Terminalia arjuna* were considered for constructing final volume equation. All possible combinations of linear equations were developed with the relationship of total volume (V), with diameter at breast height (DBH), Total height (H) and basal area (BA). The most appropriate model was selected considering the higher adjusted coefficient of determination (Adj R²), low root mean square error (RMSE) and other parameters used for model adequacy checking such as Durbin Watson statistics (Dw), Anderson darling normality test etc. Overall result indicates that *Terminalia arjuna* is a higher value timber species which needed to introduce to conserve riparian areas and timber volume can be estimated by using the below equation

$$\ln V = -1.50 + 0.572 \ln (D) + 1.06 \ln (H) + 1.11 BA^2$$

Keyword: Riparian species, *Terminalia arjuna*, Volume, Diameter at breast height

O1-16 THE PRESENT CONDITION OF THE LAKEFRONT VEGETATION IN KASUMIGAURAMasato Ono¹, Ichirou Nagai¹, Jun Hijikata², Mitsuyuki Ooishi², Naoki Uenoyama²

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In Lake Kasumigaura, the environmental changes such as water quality degradation and the development of lakeshore embankments in the late 1960s are known as the causes of a large-scale reduction of aquatic plants in the coastal wetland in 1997. Various mitigation measurements have been applied to conserve the coastal wetland, such as the development of wave-breaking facilities and beach nourishment. Despite of those efforts, the decrease of the aquatic plants including *Phragmites australis* have continued afterward in approximately 20 years to the present. This study investigates the changes in the coastal vegetation in the Lake Kasumigaura, Nishiura, for the last 20 years in terms of the spatial distribution, species composition, and characteristics, using vegetation maps. In addition, this study analyzes the possible causes for those vegetation changes. The results show that the reduction of coastal wetland mainly composed of aquatic plants has found all over Nishiura and also reveals that the invasion and growth of tree species in which replaces the aquatic plant species. Furthermore the result illustrates that the size of the coastal wetland in the conserved area has been maintained even though in the unconserved areas the reduction of the coastal wetland has continued. In the future, based on these results, it is thought that it is necessary to develop a methodologies to create and maintain the coastal wetland while resolving the decreasing trend, and to further promote conservation measures.

Keyword: Natural regeneration, Lakefront vegetation, beach nourishment, Forestation, Ecosystem function

O1-17 A STUDY ON THE RELATION BETWEEN THE WATER LEVEL IN LAKE BIWA AND THE CHANGE OF THE SUBMERGED PLANT COMMUNITY

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Japan Water Agency

Japan Water Agency (JWA) conducted the Lake Biwa Development Project for the purpose of water resource development and flood control of Lake Biwa and Yodogawa, and started to operate and maintain the facilities in April 1994. JWA is investigating the effect of water level management on the growth of submerged plants by means of diving observation at 3 investing lines, Hayasaki district of north area, Adogawa district of western area and Akanoi district of south area every year since 1997.

In this paper, we focused on the change in the priority of the area percentage of *Hydrilla verticillata* and *Potamogeton maackianus* by the low water level in 2002 from autumn to winter. As a result, it was inferred that the low water level in winter changed the area percentage of *P. maackianus* at south lake.

Keyword: Lake Biwa Development Project, water level management, submerged plants, low water level in winter, biodiversity assessment

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O1-18 ON INHABITATION OF BIRDS BELONGING TO THE FAMILY CHARADRIFORMES AND SCOLOPACIDAE IN LOTUS FIELDS ON THE SHORE OF LAKE KASUMIGAURA

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Birds which belong to the family Charadriiformes and Scolopacidae inhabit depending on shores, in particular mudflats. On the other hand, there are a lot of lotus fields, which provide mudflats, in the alluvial lowlands on the shore of Lake Kasumigaura. It got confirmed by observations for 11 years that 28 species of the families including ones registered on the Red List of Japan's Ministry of the Environment inhabit in the lotus fields, and most of them were observed there through almost a year except June and July or several months.

Keyword: endangered species, lotus fields, plover, sandpiper

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O1-19 SPECIES RICHNESS AND ENDEMISM OF VERTEBRATE FAUNA IN AND AROUND FOUR LAKES IN AGUSAN DEL SUR, PHILIPPINES

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Lakes are important wetlands that provide critical habitats for vertebrates. In this study, species richness and endemism of vertebrates were assessed in four lakes of Agusan del Sur. Cruising, mist netting, and McKinnon's List methods were employed to document vertebrates in the area. Forty-eight vertebrate species comprising 38 birds, three bats, and seven herpetofauna (three anurans and four reptiles) were recorded in the four lakes of Agusan del Sur. A low endemism of 29% was documented consisting of 10 species of birds, one bat, and three herpetofauna. Two Philippine endemic species have vulnerable status, namely, *Anas luzonica* (Philippine duck) which was only recorded in Oromica Lake and *Oreophryne anulata* (Mindanao Cross Frog) which was only found in Nato Lake. The endemic bat species, *Ptenochirus jagori* (Greater Musky Fruit Bat) was the only bat species found in all lakes sampled. A high species diversity with even distribution of species was recorded in the lakes of Agusan del Sur where Nato Lake had the highest vertebrate species richness ($S=41$) and diversity ($H'=3.714$). Bray-Curtis cluster analysis showed that Lakes Oromica, Nato, and Los Arcos had the highest similarity percentage in terms of birds while Lakes Himbang and Nato had the highest similarity percentage of herpetofauna. Lakes Oromica and Nato were more similar in bat composition. Conversion of forest surrounding the lake into agricultural purposes was observed as threat to the vertebrate fauna in the area. The presence of three vulnerable species indicates the need for conservation of the four lakes in this study.

Keyword: biodiversity evaluation, endangered species, invasive alien species, biological resource use, ecosystem services

O1-20 THE LIVING CONDITION OF FRESHWATER BIVALE IN KASUMIGAURA LAKE AND ITS CHANGE

Okimichi Suzuki

I have investigated on living conditions of freshwater bivalve kinds in Kasumigaura Lake and rivers since 1993. I confirmed 9 kinds of the bivalve which is *Anodonta woodiana* (Lea), *Anodonta calipygos* kobelt, *Unio douglasiae nipponensis* Martens, *Hyriopsis schlegeli* (Martens), *Corbicula leana* Prime, *Limnoperna fortune* (Dunker), *Cristaria plicata plicata* (Leach), *Inversuno jokobamensis* (Ihering) and *Hyriopsis cumingi* [Unionidae]. How ever it is difficult to confirm it nowadays. Those living amount indicate decrease tendency in a long term.

Keyword: Biodiversity evaluation

Technical Session 1: Biodiversity and Biological Resources Section 7: Invasive Alien Species 1

O1-21 SPATIAL ANALYSIS OF MACROPHYTES DIVERSITY AND DISTRIBUTION IN A FEW SELECTED LAKES AND RESERVOIRS IN SOUTHEAST ASIA; WITH SPECIAL REFERENCE TO MALAYSIA, INDONESIA AND MYANMAR

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Southeast Asian inland lakes and reservoirs are important ecosystem which functioning in both ecological and economical services. The primary factor that distinguishes wetlands from other land forms is the characteristic vegetation of aquatic macrophytes, adapted to the unique hydric habitat. Therefore, the objective of this study is to analyze the macrophytes diversity and distribution represented in a few selected lakes and reservoirs of Malaysia, Indonesia and Myanmar. The field survey were carried out from February 2015 until April 2018 in eight selected lakes, namely Chini Lake, Bera Lake, Chenderoh Reservoir, Temengor Reservoir (Malaysia), Tempe Lake, Jatiluhur Reservoir, Saguling Reservoir (Indonesia) and Inle Lake (Myanmar). There were four natural lakes and four man-made reservoirs. All of them play multi-functional roles including as a source of fisheries and tourism, power plant, as well as water sources for irrigation. In Malaysia, there are four consecutive reservoirs along Perak River, whereas in Indonesia, there are three consecutive reservoirs along Citarum River. The result showed relatively high in diversity of macrophytes in natural lake compared to man-made reservoir. Subsequently, the characteristics of the lakes are the most important aspect for macrophytes distribution. A better understanding of spatial patterns of macrophytes diversity and distribution would help to improve conservation efforts as well as for the invasive alien species monitoring program because prevention is the most effective method to control the invasive species.

Keyword: Biodiversity evaluation, Ecosystem functions, Invasive alien species

O1-22 HABITAT CONDITIONS AND STRUCTURES OF RARE RIVERSIDE GRASSLAND PLANT COMMUNITIES ON THE TENRYU-GAWA RIVER SYSTEM IN THE NAGANO PREFECTURE, JAPAN

Miho Nakahara, Kumiko Okubo

Shinshu University

Recently, populations of river-specific plants and herbaceous perennial species in Japan have decreased and extinct. However, in a preliminary investigation, we confirmed the presence of rare plant communities in the Tenryu-gawa River system. And, alien plants such as *Coreopsis lanceolata* and *Robinia pseudoacacia* invaded and established in the natural grassland in Tenryu-gawa River system. Therefore, the purpose of this study was to explore the habitat conditions and structures of these rare plant communities on the riverside grassland vegetation in this area to conserve these endangered species. Vegetation and environmental conditions of the riverside communities were investigated in the summer of 2017. All investigation plots were 28, and the area of one quadrat was 2m × 2m. Five types of communities were distinguished by a TWINSpan classification. These were primarily classified into three high-water channel site types and two low-water channel site types. The endangered herbaceous perennials, such as *Cynanchum paniculatum* or *Ixeris chinensis* subsp. *strigosa*, appeared in high-water channel site types, whereas the river-specific plants, such as *Potentilla chinensis* or *Artemisia capillaris*, dominated in low-water channel site types. On the other hand, alien plants such as *Coreopsis lanceolata* invaded in all types. It was thought that many alien plants had a negative influence on the growth of the rare plant communities.

Keyword: endangered species, invasive alien species

O1-23 COUNTERMEASURES FOR OVERGROWTH OF INVASIVE AMPHIBIOUS WATER PRIMROSE: CASE OF LAKE BIWA, JAPAN

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After its first finding in 2009, Water Primrose, an invasive amphibious weed, has greatly proliferated in Lake Biwa, replacing with preceding alligator weed, another invasive weed. Because of expected negative ecological impacts, the programs to control these weeds were started in FY 2013. In 2004, mechanized removal was installed in a large-scale to suppress their overgrowth. Once having experienced a serious rebound, a decreasing trend in their coverage areas was achieved in these 2 years through effective combination of mechanical and manual removals and intensive patrol after removal. These weeds have intruded into Lake Kasumi-ga-ura and other eastern lakes such as Tega-numa and Imba-numa.

Keyword: invasive alien species

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O1-24 CURRENT STATUS AND COUNTERMEASURES FOR THE INVASIVE FRESHWATER BIVALVE *LIMNOPERNA FORTUNEI* AROUND LAKE KASUMIGAURA, JAPAN

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Limnoperna fortunei (the golden mussel) is an invasive freshwater bivalve native to China and the Korean Peninsula. This epifaunal species can have harmful effects on the environment and man-made structures, such as irrigation facilities. In Japan, it was first found in Lake Biwa in 1992, and began to be found in eastern Japan, including the Tokai and Kanto regions, in the 2000s. We investigated the distribution and expansion of this mussel in Lake Kasumigaura (the second largest lake in Japan) and its surrounding areas. From 2006 to 2012, the mussel expanded its distribution from 48% of the shoreline of Lake Kasumigaura to 83%; its density (as indicated by the number of mussels collected in 10 minutes by a single researcher) in 2012 was on average 3.8 times that in 2006. The mussel was found in headrace channels, reservoirs and rivers that draw water from Lake Kasumigaura. Spatial distribution and genetic data suggest that one of its most important routes of range expansion is via artificial waterways. The organization managing the water facility that takes water from Lake Kasumigaura is trying to monitor and eliminate the mussel in the facility to suppress its spread through the canal network served by the facility.

Keyword: Alien species, Range expansion, Irrigation facilities

Technical Session 1: Biodiversity and Biological Resources Section 8: Invasive Alien Species 2**O1-25 TROPHIC STATUS OF *CHITALA ORNATA* (OSTEICHTHYES; NOTOPTERIDAE), AN INVASIVE FISH SPECIES IN SRI LANKA AND IMPACTS OF ITS INVASION ON FISH DIVERSITY IN TRIBUTARIES OF BENTOTA RIVER**

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Fish were sampled using gill nets, seine nets, cast nets and some were also collected from fishermen's catches at the tributaries of the Benthota River in Katapola, Ganegoda, Avitthawa, Yagirala and Galatara from August to December 2016. To investigate the potential threats from *Chitala ornata*, its stomach contents were analyzed and quantified using the Point method based on the percentage of bio volume per food category. Ten species of fish were recorded from all five sites, including two endemic species, *Clarias brachysoma*, *Channa orientalis*. Some indigenous species such as *Puntius vittatus* (n=371), *Rasbora daniconius* (n=120), *Puntius dorsalis* (n=33) and *Trichogaster pectoralis* (n=52) were also caught in reasonable number. Parts of fish (scales, fins and flesh), mollusks, adult insects, insects larvae, macrophytes and digested/detritus matters were observed in the stomach. Among the stomach contents of *C. ornata* larger than 15 cm, highest bio volume (72%) comprised of parts of fish which was significantly higher ($p < 0.05$) than other food categories. Macrophytes accounted for the lowest biovolume (6.5%) which was significantly lower ($p < 0.05$) than the other food categories. However gut contents of *C. ornata* smaller than 10 cm comprised of a higher percentage of algae and plant materials (60%). Remains of fins of *Channa orientalis*, and *Rasbora daniconius* and some invertebrates observed in stomach contents of *C. ornata*, indicated its negative impacts on biodiversity in study sites. Therefore urgent attention should be paid to population control of *C. ornata* and to prevent its further invasion into new habitats.

Keyword: invasive alien species, fisheries, Stomach contents, endangered species, Biodiversity

O1-26 ARE JAPANESE RICE FIELDS THREATENED BY THE NEW INVASIVE ALIEN SPECIES OF TADPOLE SHRIMP (*TRIOPS STRENUUS* WOLF, 1911) FROM WESTERN AUSTRALIA?

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Three species of tadpole shrimp, i.e., *Triops sinensis* (Uéno, 1925) (resurrected by Naganawa in 2018, previously synonymized erroneously in Japan with *Triops granarius* (Lucas, 1864)), *Triops longicaudatus* (LeConte, 1846) and *Triops cancriformis* (Bosc, 1801-1802), have been known from Japan. The author described a fourth *Triops* species (= *Triops strenuus* Wolf, 1911) living in the rice fields of Shirahama and adjacent area of Wakayama Prefecture (a southern area of Honshu, the largest of the four main islands of Japan). This species was probably endemic to the Australian continent, and no habitat distribution outside of Australia has been reported so far. The impact on the existing ecosystem of Japan is quite unknown, and therefore, it is necessary to announce this intrusion into Japan in order to clarify the invasion route, habitat ecology, and the future measures against this new alien species. This invasion is considered to be caused by the resting eggs brought together with silica sand (imported from Western Australia into Japan for the large-scale beach improvement). There are two possible routes of dispersal from the coastal sand to the rice fields where *T. strenuus* had been found in Japan: (1) windborne dispersal and (2) dispersal by human activities (i.e., tourism) and/or animal vectors (e.g., water birds and crows). The results presented here also describe the phylogenetic relationship with all the Australian species described so far, but also all the known *Triops* species of the world, based on the nucleotide sequences of mitochondrial DNA.

Keyword: invasive alien species (IAS), rice fields, ecosystem management, consensus building, nature conservation

O1-27 THE WIDESPREAD OF THE REDCLAW, *CHERAX QUADRICARINATUS* IN INDONESIAYusli Wardiatno¹, Jiří Patoka², Ali Mashar¹, Yonvitner Yonvitner¹, Daisy Wowor³, Rikho Jerikho¹, Mohammad Takdir⁴, Lora Purnamasari⁵, Miloslav Petrtyl², Lukáš Kalous², Antonín Kouba⁶, Martin Bláha⁶

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Redclaw (*Cherax quadricarinatus*, von Martens) is a crayfish native to north-eastern Australia and southern New Guinea, being found for the first time west of the Wallace Line in Java in 2016. Following introductions for aquaculture purposes, it escaped from culturing facilities, exhibiting invasive habits in various tropical and subtropical countries. Based on climate matching, its further spreading within Indonesian territory was predicted. We surveyed selected localities within Indonesian territory to check the species occurrence. Redclaw crayfish were found in numerous rivers, lakes, ponds and reservoirs in Batam and Bintan Islands, Java, Sulawesi, and Sumatra. Some stocks were apparently well established, providing a food source for locals and sustaining catching for pet trade purposes. Since there are no effective regulations of this crayfish introductions and exploitation in Indonesia, its further dissemination and spread to new localities is expected. This will lead to the devastating consequences toward often endemic freshwater biota in this prominent biodiversity hotspot. Increased attention to this issue, especially at the level of wildlife management and national environmental policy, is urgently needed.

Keyword: Redclaw, biological invasion, non-indigenous species, Parastacidae, aquaculture

Technical Session 1: Biodiversity and Biological Resources Section 8: Invasive Alien Species 2**O1-28 ECOLOGICAL BARRIERS AND AQUATIC ECOSYSTEM ISOLATION - THE EFFECT ON MOSQUITO POPULATIONS AND THEIR NATURAL ENEMIES IN CHIANG MAI CITY, THAILAND**

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Rapid urbanization is the main reason of habitat isolation and fragmentation in many city area of the world. Extinction, decreasing of biodiversity and balancing of community lost were the effect of habitat isolation. Mosquitos (Diptera: Culicidae) are the vector of many pathogen disease. Mosquito larva as prey in aquatic ecosystem could got some effect on unbalancing of community by Ecological Barriers and Aquatic Ecosystem isolation. There are many small wetland, freshwater Lakes and ponds in Chiang Mai, Thailand. Sixteen observation sites were selected by grid sampling method (3x3 km²). The physicochemical data and biological data were analyzed and compared between every isolated area and main area. For the result, the newly created small canal, ponds that isolated from the main of larger habitat and ecological barriers as a water gate are inducing unbalancing of community, increasing number of mosquito larva and increasing pond breeding site of mostly *Culex* species mosquito. Result of physicochemical and biological parameters show dissolve oxygen (DO), Evenness of aquatic organism and percentage of predator were negative correlation between number of mosquito larva. Moreover, good water quality was positive correlation between number of predator. From the result, the biological barriers and aquatic environment isolation by human urbanization was indirect effect of the mosquito born disease in many countries of tropical zone. Therefore, every construction and city management have to concern with the biological barriers and isolation.

Keyword: ecological fragmentation, population, mosquito born disease, predator-prey, habitat

Technical Session 1: Biodiversity and Biological Resources Section 9: Fisheries 1

O1-29 THE STATE OF GHANA'S AQUACULTURE PRODUCTION ON THE VOLTA LAKE AT A GLANCE

Isaac Nyameke

Ghana Aquaculture and Fish Network

This present study was conducted to establish the number of tilapia farms on the Volta Lake, their farm size, employees experience in nutrient discharge and pollution control, annual production and feed used. Owners of 129 farms (83 small, 32 medium and 14 large scale) were interviewed using qualitative and quantitative questionnaires. The 129 farms employed 1,379 permanent and 1,200 casual workers with 3,392 cages (59% in used). The owners had no experience in tilapia farming and selected their sites based on physical characteristics without in-depth research. Only 3% had legal documents to operate on the Volta Lake. The 129 farms produced 18,632.27 metric tons of fish in 2015 and 14,711.82 metric tons in 2014. Fifty-Eight percent fed based on stock density, 20% used body weight while 16% used the age of the fish. Ninety five percent do not measure water quality parameters, engage in any kind of pollution control and know the amount of phosphorus being deposited in the lake. Ninety percent had no knowledge about the carrying capacity and zonation of the lake. All the farmers use between 70 and 90 bags (25kg per bag) of feed to produce 1 metric ton of fish. Based on that, the author estimated that about 31,674.74 metric tons of feed were used in 2015 and 25, 010.09 metric tons in 2014 with FCR of 1.7. The findings led to the conclusion that Ghana's aquaculture development on the Volta Lake needs to be better planned to prevent negative environmental impacts in the future.

Keyword: Volta Lake, Tilapia production, Nutrient discharge, Site selection, Carrying capacity

O1-30 SPATIAL AND TEMPORAL VARIATION OF LENGTH-WEIGHT PARAMETERS AND CONDITION FACTORS OF COMMERCIAL FISH SPECIES IN LAKE NASSER, EGYPT

Walid Aly¹, Alaa El-Far¹, Harrison Charo Karisa³, Ahmed Mohamed Nasr-Alla³, Khaled Youssef Abouelfadl²

¹WorldFish and National Institute of Oceanography and Fisheries, ²Department of Aquatic Ecology, Faculty of Fish and Fisheries Technology, Aswan University, Aswan, Egypt, ³Fisheries and aquaculture, WorldFish, Egypt

Length and weight data of fish populations are necessary in stock assessment models and ecosystem modelling approach. Also, they could be used to spatially compare between different fish population under different environmental conditions. This study provides an updated information on the length weight relationships and condition factors of six fish species in Lake Nasser, Egypt. It also investigates how these parameters affected by variation in environmental characteristics of the Lake, therefore it presents the first reference on the spatial and temporal variation of these data in Lake Nasser. More than 13,000 fish were collected on monthly basis to cover different geographical and seasonal varieties of the lake. The values of the growth coefficient b obtained in this study were very close to the values recorded by previous studies with slight inconsistency while the average condition factors K were generally lower than that reported for the years between 1984 and 2000. Moreover, results have shown an overall statistically significant difference in seasons and locations' total length, total weight and condition factor means. The results obtained from this study are contributing to the knowledge of fish populations in Lake Nasser and highlighting the spatial and temporal variation of fisheries biological parameters in such large lake system. This variation should be considered by fisheries scientists and managers for future studies.

Keyword: fisheries, biological resource use

O1-31 SAMPLING OF FLUCTUATION FACTORS OF THE POPULATION OF *HYPOMESUS NIPPONENSIS* IN LAKE KASUMIGAURA AND EARLY-STAGE POPULATION EVALUATION MODEL

Fumitaka Tokoro

Ibaraki Fisheries Research Institute, Freshwater Branch office

In order to enable a sustainable exploitation and to manage the stock of *Hypomesus nipponensis* (Wakasagi (Japanese), Pond Smelt (English)) in Lake Kasumigaura, the Ibaraki Fishery Research Institute is conducting research to assess the population of *H. nipponensis* and to determine the affecting factors. To identify the factors that influence the population of *H. nipponensis*, we have tested different factors to see the correlation between them and the fluctuation of the fish population by using the research results data from 212 items of 18 different categories, such as water quality, prey organisms, and stock evaluation. The results have shown a relatively strong correlation between the fluctuation of *H. nipponensis* population and 1/ population level of the previous year 2/ amount of prey organisms available at the time of hatching and 3/ weather conditions. Consequently, we can suggest that environmental conditions of the lake and the fishing industry are not the only factors that affect the fish population and that the weather conditions factor cannot be ignored. We performed a GLM analysis with these factors as the explanatory variables and developed an early-stage population evaluation model.

Keyword: Pond Smelt, *Hypomesus nipponensis*, Fisheries, Bioavailable

Technical Session 1: Biodiversity and Biological Resources Section 9: Fisheries 1

O1-32 “FISH CONSERVATION AREAS AS A TOOL TO STRENGTHEN FRESHWATER COMMUNITY FISHERIES: PROJECT EXPERIENCE FROM THE TONLE SAP”

Pheakdey Sorn

Water and Wetlands Coordinator, IUCN Cambodia

As one of the world's most unique freshwater ecosystems, the Tonle Sap lake is a dynamic socio-natural system. It is also a system under threat by rapid environmental change and weak governance. Not only does this have implications for the wider Tonle Sap ecosystem, but for the livelihoods of millions of Cambodian citizens, who depend on the resources provided by this natural ecosystem. To address this, the EU-funded Non-State Actors project, implemented by the International Union for the Conservation of Nature (IUCN) and the Fisheries Action Coalition Team (FACT), sought to improve the livelihoods of fishing communities at three target sites in the Tonle Sap: Kampong Phluk, Boeung Chhmar, and Phlov Touk. In collaboration with the target communities and relevant authorities, each site implemented a fish conservation area (FCA) where fishing is prohibited year round to protect key fish refugia, benefitting both the aquatic ecosystems and productivity of community fisheries. The project applied an ecosystem-based management approach, combined with common pool resource management principles and a highly participatory approach to achieve sustainable conservation and livelihood benefits in these communities. This paper outlines key elements with the intention of providing flexible guidance for other projects working for sustainable and conservation based community fisheries management in the Tonle Sap and beyond.

Keyword: sustainable fisheries conservation and livelihood benefits, fish conservation area, community-based natural resource management, common-pool resource management, ecosystem-based approach

Technical Session 1: Biodiversity and Biological Resources Section 10: Fisheries 2

O1-33 APPLICATION OF A MODEL FOR CARRYING CAPACITY FOR AQUACULTURE TO A BIG OVEREXPLOITED LAKE

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¹Scientific Center of Zoology and Hydroecology, ²University of Cadiz

Lake Sevan in Armenia is one of the most overexploited freshwater mountain ecosystem in the world. Over the long term, severe and diverse anthropogenic pressures have converted it from an oligotrophic "trout" lake into a mesotrophic "carp" reservoir. Water level lowering during decades, drying out of the spawning grounds of endemic trout, illegal fishing, insufficient control of organic and pollutant input from catchment, occasional introduction of alien species, current water level fluctuations has caused significant changes in the limnosystem. The current situation is characterized as a disturbed ecosystem stability as evidenced by species succession at all trophic levels, intensification of bioproduction in the lake, shift of production-destruction processes. A recent governmental program for the restoration of the endemic Sevan trout stock through a cage-based aquaculture in the lake could be an effective intervention to restock the lake with valuable trout species and improve its ecosystem services. However, it is needed to estimate the carrying capacity of the lake given its current vulnerability and instability. In this work, we estimated the capacity of the lake to assimilate organic input from aquaculture with the maximum precaution, taking into account its historical trends and the current state.

Keyword: cage aquaculture, trout re-stocking, assimilative capacity, water level, anthropogenic pressure

O1-34 MASS BALANCED MODEL OF LAKE VOLTA FISHERIES: THE USE OF ECOPATH MODEL

Emmanuel Tetteh-Doku Mensah¹, Hederick R. Dankwa¹, Torben L Lauridsen², Ruby Asmah¹, Benjamin B. Champion³, Regina Edziyie³, Villy Christensen⁴

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A mass-balanced model of trophic interactions among 10 key functional groups of Lake Volta was constructed using the Ecopath software to analyze the interactions and energy flows within Lake Volta. The study was based on secondary and primary data on fish catch, diet composition, phytoplankton and zooplankton biomasses, collected in 2015 and 2016. An additional information on growth parameters of major species required for balancing the Ecopath model were obtained from FishBase. The functional groups were detritus, phytoplankton, zooplankton, benthos, prey fish, *Tilapia*, *Bagrus*, *Chrysichthys*, *Alestes* and *Synodontis*. In this ecosystem, four trophic levels were identified and the energy flow mainly occurred within the first three levels. The calculated ecotrophic efficiency value of the primary producers (phytoplankton: 0.075; detritus: 0.090) showed that they were least exploited compared to the zooplankton (0.80) and benthos (0.50), the secondary producers. The main energy flows in the ecosystem were from detritus and phytoplankton at trophic level 1 with *Bagrus* species being the top predator at level of 3.30. The connectance index (0.44) and system omnivory index (0.06) indicated that the ecosystem was unstable, immature and still at a developing stage.

Keyword: ecosystem functions, ecological network, fisheries, data analysis technologies and modeling

Technical Session 1: Biodiversity and Biological Resources Section 11: Conservation, Management and Restoration 1

O1-35 THE EVALUATION OF THE FULFILMENT OF THE OBLIGATIONS UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY IN THE SOUTH CAUCASUSAlla Khosrovyan¹, Bardukh Gabrielyan²¹University of Cadiz, ²Scientific Center of Zoology and Hydroecology

In the South Caucasus region, severe pressures were exerted on the water and biological resources of freshwaters that resulted in biodiversity decline or even extirpation of native populations. This work analyzed the state of the freshwater biodiversity in the selected countries of the region (Armenia, Azerbaijan, Georgia and southern Russia) before and after ratification of the Convention on Biological Diversity. A critical assessment of the level of the fulfilment of commitments to the Convention after ca. 20 years of ratification was conducted. Instruments or mechanisms that can improve the implementation of the provisions of the Convention were discussed.

Keyword: CBD, commitment to the Convention, freshwater biodiversity, protected area

O1-36 EFFECTS OF ENVIRONMENTALLY-FRIENDLY FARMING ON BIODIVERSITY IN RICE FIELDS

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Institute for Agro-Environmental Sciences, NARO

The expansion and intensification of agriculture have been a serious threat to biodiversity across the globe. To halt the decline in biodiversity, environmentally-friendly farming has been introduced in many regions including Asia. The effectiveness, however, has not been fully understood in Asian rice-paddies. The present study summarized the achievements of past and current studies on the effectiveness of environmentally-friendly farming on representative taxonomic groups (plants, arthropods, frogs, fish, and birds) in Institute for Agro-Environmental Sciences, NARO, Japan. We will particularly introduce the outcome of our recent research project, conducted during 2013-2017 with the financial support by the Ministry of Agriculture, Forestry and Fisheries, Japan.

Keyword: biodiversity assessment, environmentally-friendly farming

O1-37 RESTORATION OF A METAPOPOPULATION OF *ASTER KANTOENSIS* KITAMURA, AN ENDANGERED FLOOD PLAIN PLANT ENDEMIC TO JAPANNoboru Wada Kuramoto¹, Hisako Okada¹, Sei-Ichi Ito², Ryo Nomura², Ximei Wu¹, Masami Ito³, Kenji Kushihara³¹School of Agriculture, Meiji University, ²Academy of Nature Environment, ³Keihin River Office

Aster kantoensis Kitamura is an endangered plant species, endemic to the gravelly floodplains of a few eastern central Japanese rivers, and a flagship species for gravelly floodplains. Reduction in habitat could accelerate the decline of *A. kantoensis* metapopulations. To avoid extinction, seven restoration programs were initiated along the Tama River in the 1990s and 2000s. However, only two programs, including our experiment, currently continue. We examined the effect of human-aided seed dispersal in 2002 on an artificial gravelly floodplain in the Nagata Area. After 15 years, the metapopulation was still thriving, as flooding created new safe sites for seed germination and seedling establishment. Furthermore, small populations of *A. kantoensis* were found to be thriving in the lower course of the Tama River. The institutional administration added 90000 m³ of gravel to the upper course of the Nagata Area. A large flood occurred in 2007 after which the population of *A. kantoensis* declined, before recovering in 2008. The dynamic aspects of this metapopulation may have recovered. Since maintenance of the first artificial floodplain was difficult, other plants have been growing densely in the area, which has reduced in 1/8 reduction in the original area. This experiment was conducted in collaboration with institutional administrators, citizens, and scientists. The restoration success of *A. kantoensis* in the artificial gravelly floodplain has led to similar restoration efforts near other rivers in Japan.

Keyword: endangered species, nature restoration, gravel, extinction, collaboration

O1-38 A PROPOSED APPLICATION OF TRIBUTARIES FOR AQUATIC PLANT RESTORATION ON THE LAKE BASIN SCALE

Masatoshi Denda

Public Works Research Institute

In this study, we surveyed the potential of the tributaries of Lake Kasumigaura to serve as aquatic-vegetation-restoration areas. Our results show that although red-listed species of aquatic vegetation grow in these tributaries, and invasive species grow in some of these tributaries as well. Therefore, careful selection of tributaries will be important for planning the meta-population network.

Keyword: Aquatic plant, restoration, basin scale, tributaries into lake

Technical Session 1: Biodiversity and Biological Resources Section 12: Conservation, Management and Restoration 2**O1-39 MAINSTREAMING BIODIVERSITY INTO INLAND FISHERIES AND AQUACULTURE (WITH SPECIAL FOCUS ON WETLANDS) - SCOPES AND CHALLENGES**

Rupam Mandal, Thomson Jacob, Sugunan V V

Centre for Biodiversity Policy and Law (CEBPOL), National Biodiversity Authority, Ministry of Environment, Forest & Climate Change, Chennai

Mainstreaming of biodiversity is basically the process of integrating biodiversity concerns into policies and practices that impact and work on biodiversity. The Convention of Biological Diversity (CBD) advocated for this in its Article 6(b), which has also been reflected in Biological Diversity Act, 2002 of India. India has developed 12 national biodiversity targets, as per the directives from CBD, which are to be met by 2020, in line with National Biodiversity Strategy and Action Plan. The targets (5, 6 & 8) related to inland fisheries emphasize to achieve sustainable fisheries, conservation of ecologically representative areas and to safeguard areas of ecosystem importance (e. g., inland water bodies, wetlands and aquatic fauna). India is endowed with vast inland resources which includes rivers, lakes, reservoirs, estuaries, wetlands lagoons, etc., that are providing habitats for some thousands of aquatic animal and plant biodiversity, along with various ecosystem services. These resources play a significant role in providing food, nutrition, and livelihood security of millions of people across the country, through different forms of inland fisheries and aquaculture. The present paper analyses the scopes and challenges for mainstreaming biodiversity concerns into inland fisheries and aquaculture (including wetlands) in Indian context and throws light on the present scenario and gives some recommendation in achieving this objective towards compliance to National Biodiversity Targets, Aichi Targets and Sustainable Development Goals.

Keyword: Biological resource use, Fisheries, Ecosystem services, Ecosystem management

O1-40 EXAMINATION OF METHODS FOR IMPROVEMENT OF AQUATIC ENVIRONMENT IN THE COASTAL AREAS OF LAKE BIWA USING THE STATE OF BIVALVE POPULATIONS AS AN INDICATOR

Eiso Inoue

Shiga Prefecture

In Lake Biwa, the largest lake in Japan, new problems such as elevated Chemical Oxygen Demand (COD) in water quality, overgrowth of submerged macrophytes in the shallow areas, decrease of native fish and shellfish catch occurred in recent years. Bivalves, especially freshwater clams *Corbicula* of which catch decreased remarkably, are affected by many factors constituting the lakeshore environment, for instance, water quality and substrate conditions as habitat, and phytoplankton community as food. Therefore, the state of bivalve populations should be a good indicator that comprehensively expresses the state of water quality and ecosystems, and is easy to understand for local residents. For the restoration or regeneration of shallow sandy substrates in the coastal area of lakes, the Japanese Ministry of the Environment and Shiga Prefecture started surveys on bivalves and benthic macroinvertebrates in 2017, and also started a restoration demonstration of the lakeshore environment by collaboration with local residents. In addition, policy makers, researchers and residents are collaborating in compiling a guide how to improve coastal environment of lakes. We report the progress of these surveys and restoration demonstration, and a content image of the guide.

Keyword: ecosystem functions, ecosystem management, nature restoration

O1-41 HABITAT RESTORATION FOR SHIJIMI CLAM USING LOCAL KNOWLEDGE IN THE BRACKISH LAGOON KUGUSHI-KOYasushi Miyamoto¹, Tadahisa Seikai², Takehito Yoshida^{3,4}

¹Fukui Prefectural Satoyama-Satoumi Research Institute, ²Fukui Prefectural University, ³Research Institute for Humanity and Nature, ⁴University of Tokyo

Local knowledge (LK) is the knowledge that developed in a given region with histories of interaction with their natural environments, and had been historically used for resource use and conservation practices in estuaries and coastal habitats. However, it is overlooked recently in reliance on scientific knowledge and new technological ability. In this study, we identified local practices using LKs for conserving commercial bivalve Shijimi clam and verified whether the restoration practices resulted in the improved clam habitat in the brackish lagoon Kugushi-ko, in western Japan. It is demonstrated that elderly fishermen recognized that recent decrease in the clam harvest in the lagoon was mostly due to habitat loss, since the harvest declined after coastal revetment project in the late 1970s. On the assumption that the clam resource is under habitat limitation, they initiated habitat restoration practices recently using two different methods: modern method depending on engineering techniques using allochthonous sediments, and traditional method using LKs which depends on riverine sediment loads. The clam density was higher in the restored habitats than unrestored sites, and highest in the traditionally restored habitat using LKs, suggesting the effectiveness of the traditional restoration. These results suggest that approaches to nature restoration can be determined by using LKs even in less ecologically studied regions.

Keyword: habitat loss, habitat restoration, nature restoration, Shijimi clam, local knowledge

O1-42 SWIMMABLE LAKE KASUMIGAURA BY SATOHAMA MAKING PROJECT

Haruki Ito, Akira Horikoshi, Toshio Takishita, Setsuko Takagi

Kasumigaura Citizens' Association

Kasumigaura Citizens' Association has been established in 1996 putting mind of the Lake Kasumigaura Declaration made in the 6th World Lake Conference in an idea. Concentrating citizens' wisdom that we cultivated in the partnership with citizens, administrations, researchers, and industries, we continue working on promotion, enlightenment of the quality of the water purification towards "the Swimmable Lake Kasumigaura". "Swimmable Lake Kasumigaura 2020 Citizens' Plan" includes more concrete plans in various fields such as life culture, waterside interchange, environmental preservation, ecosystem maintenance, history culture, regional economy, enlightenment, environmental learning. Especially lake shore maintenance is very important. We are practicing the SATOHAMA making project related to the beach reclamation on an ongoing basis. SATOHAMA is a created word that joined "Sato" where the person lived in to "Hama"(the beach) which nature made. We think that it promotes the interest of people for the Lake Kasumigaura and consciousness and an action to quality of the water purification by utilizing and maintaining SATOHAMA which connect the beach with people.

Keyword: nature restoration, ecosystem functions, riparian areas, community development, community

Technical Session 2: Sustainable Use of Freshwater Resources Invited Lecture**TS2-1 THE STATE OF THE GLOBAL WATER RESOURCES:
HOW SUSTAINABLY DO WE USE THEM?****András Szöllősi Nagy**

National University for Public Service (NUPS)

The presentation will overview the current global perspective on freshwater with a view identify major likely future challenges along with an outline of potential opportunities for solutions. Given the projected demands for water, and the likely impact of climate variability and change, the present water uses, including those in/of rivers and lakes, are clearly not sustainable. Finally, the political recognition is born that freshwater is a major global issue. The presentation will attempt to identify the technical, social and ecological challenges that need to be addressed to establish sustainable river development and management practices for the future in the context of lake management. It will look into the catchment scale hydrological impacts of various global change drivers. All these changes imply strong non-stationarity. It will be argued that the design methodologies, such as the concept of design floods, developed under the hypothesis of stationary hydrological processes, need to be revisited and updated. Potential impacts of climate change will also be outlined along with the likely increase in the occurrence of extreme events such as floods and droughts. Mitigation and adaptation measures will shortly be outlined. Of the later structural and non-structural measures will be shortly examined. The presentation will argue that the re-examination of some of the structural measures, such as the need for more water storage, the need for more intensive hydropower development and the need to further develop inland navigation, respectively, is a timely task. These measures will pose new social and ecological challenges but also offer new opportunities. Various hypotheses will be entertained as to the relative importance of the various global drivers at catchment scale. The big question is: are we really dealing with the most important issues? What is indeed the major driver that will determine how rivers and lakes will be managed two generations from now? In case of transboundary water bodies, where nearly half of humanity leaves, who calls the shots? How effective international cooperation is? Why do we need that, to start with? Is sustainable water management an ethical and cultural issue or simple a matter of engineering by more structures? Isn't water just a matter of quick technical fixes by applying more technology? Is water a source of conflict or that of cooperation? Some of the potential responses to these questions will be outlined along with an assessment of emerging research needs.

Curriculum Vitae

Szöllősi-Nagy is Professor at the National University of Public Service (NUPS), Budapest, Hungary. He served in UNESCO for more than 25 years, first as the Secretary of UNESCO's International Hydrological Programme (IHP) in Paris and later as Rector of the UNESCO-IHE Institute for Water Education in Delft. Recipient of several major international awards. He currently serves as Governor of the World Water Council, Chairman of the Intergovernmental Council of IHP and as Chair of the international Sustainable Water Futures Programme, Brisbane, Australia.

TS2-2 RECENT DEVELOPMENT AND CHALLENGES IN THE MANAGEMENT OF WATER CYCLE AND WATER RESOURCES OF A BASIN IN JAPAN



Tsugihiko Watanabe

Graduate School of Global Environmental Studies, Kyoto University

Appropriate development and management of water resources is the basis of life and production in a basin, and for that purpose sound conservation and management of hydrological cycle is required. This is a fundamental requirement for environmental conservation in a basin and related areas and coasts as well as sustainable use of lake water resources in the basin.

In Japan, the "Basic Act on Water Cycle" was promulgated in 2014, which is a comprehensive and integrated promotion of measures concerning water circulation, including groundwater, in order to maintain and restore sound water circulation in the basin, further develop and stabilize economy and society and people's lives. In the main river systems, the "risk management type" water resource development basic plan has been advanced from 2017, based on the reduction in tightness of demand and supply of water resources, and the increase in the necessity of measures against climate change and disaster, etc.

In this report, the basic thinking on water circulation and water resource development and management in Japan and the recent improvement situation of the framework of legal system are reviewed, and the further necessary challenges for further improvement of the sustainable use of freshwater resources including lakes.

Curriculum Vitae

April 1984: Research Associate, Faculty of Agriculture, Kyoto University
August 1989: Associate Professor, Faculty of Agriculture, Kyoto University
October 1995: Associate Professor, Faculty of Agriculture, Osaka Prefecture University
March 2001: Associate Professor, Arid Land Research Center, Tottori University
April 2001: Associate Professor, Research Institute for Humanity and Nature, Inter-University Research Institute
April 2003: Professor, Research Institute for Humanity and Nature, Inter-University Research Institute
(From April 2004, Inter-University Research Institute changed to Inter-University Research Institute Corporation National Institutes for the Humanities)
April 2013: Professor, Graduate School of Global Environmental Studies, Kyoto University

Technical Session 2: Sustainable Use of Freshwater Resources Section 1: Water Resources and Water Quality

O2-1 WATER PURIFICATION FOR PORTABLE WATER USING BIO-FENCE AROUND NYANZA GULF OF LAKE VICTORIA - RESULTS IN LAVICORD PROJECT -

Tomoaki Itayama¹, Akira Morikawa¹, Outa Nicholas², Outa James², Lillian Otoigo³, Chrispin Kowenje³

¹Graduate School of engineering, Nagasaki University, ²Lavicord Project, Kenya, ³Masenon University, Kenya

Kenya has been struggling with various water problems such as shortage of water, contamination of water sources and deterioration of water environment. Of course, although the problems have been addressed not only in Kenya but also in other countries so far, many problems remain yet. If a practical solution for such problem will be obtained, the solution can be spread to other countries in the world from Kenya. Hence, in LAVICORD (The Lake Victoria Comprehensive Research for Development) project, we focused on the development of several appropriate technologies for safe water. The studies were performed at Nyanza Gulf of Lake Victoria. At several beaches in Nyanza Gulf of Lake Victoria, we found cyanobacteria blooms. Therefore, first of all, we solved the cyanotoxin microcystin contamination problem, because we elucidated the remarkable microcystin contamination in drinking water collected from beach of Nyanza Gulf. Thus we installed Bio-fence system at Ogal beach, where highest contamination of microcystin was found, to produce safe portable water. The installed bio-fence using charcoal could effectively remove microcystin from lake water. However, it was significantly affected by the water level fluctuation of Lake Victoria. We should improve the system design of Bio-fence for practical use, because the strength of water level fluctuation recently became larger.

Keyword: Lake Victoria, Water pollution, Toxic cyanobacteria, microcystin

O2-2 IMPROVEMENT OF WATER QUALITY THROUGH THE KASUMIGAURA CONVEYANCE PROJECT IN SAKURAGAWA RIVER, AND LAKE SENBAKO

Satoshi Kanai, Akira Matsuoka, Masahiko Koike, Kazuhiro Tabata

Kasumigaura Conveyance Work Office

In the Sakuragawa River, which flows through Mito City, during the summer, the water environment has deteriorated due to increase of domestic wastewater with urbanization, etc, such as the Lake Senbako and the branch river basin, and the target value is not satisfactory even when various measures are being taken. In order to cope with this situation, the Kasumigaura Conveyance Project is one of the measures of the Second Water Environment Reform and Rapid Transit Plan Sakuragawa Seiryu Renaissance II, which aims to purify the water quality of Sakuragawa River, and Lake Senbako. In addition to those purification purposes, the Kasumigaura Conveyance Project is purifying water in Lake Kasumigaura, and securing water for already-acquired water rights, and securing newly developed urban water in the downstream of Nakagawa River and Tonegawa River, which areas connected by underground water conduit and started construction in 1984, and is currently working on the project.

Keyword: water pollution, water bloom(aoko), water management, eutrophication, utilization and development of water resources

O2-3 ASSESSING THREATS TO TRANSBOUNDARY LAKES AND RESERVOIRS

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The United Nations Environment Programme (UNEP) conducted a global-scale assessment of the status of five major types of transboundary water systems (lakes; rivers; groundwater; large marine ecosystems; open oceans), ranking them in regard to the type and magnitude of the threats facing them. The transboundary lakes component of this assessment was conducted by the International Lake Environment Committee (ILEC). Using a modified global database comprised of 23 drainage basin drivers characterizing human water security and biodiversity threats, and considering selected threat ranking criteria, ILEC determined many transboundary lakes and reservoirs in both developed and developing countries exhibited significant threats. However, when the ability of the basin countries to undertake programs to address water resource issues was considered, the transboundary lakes threat rankings changed significantly. The context for interpreting the threat ranking results was especially important in considering the significance of the threat rankings, a factor the user of the ranking scores would normally provide. The assessment also illustrated how the threat rankings can be used to prioritize transboundary lakes requiring management interventions, based on the specific ranking criteria used in the assessment. A sensitivity analysis changing the relative magnitude of the threats also was conducted, again producing differing threat rankings. The need to infuse Integrated Lake Basin Management (ILBM) within the context of the Water Resources Management (IWRM) framework used in many countries also was discussed.

Keyword: basin governance, Ecosystem Services and basin management policies, wise use and development of water resources, water quality problems and pollution concerning water use, future scenarios of surface waters

O2-4 SENSITIVITY ANALYSIS OF STRUCTURE OF THE STRATIFICATION IN LAKE BIWA BY CHANGING METEOROLOGICAL ELEMENTS

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Climate change such as the change of air temperature and wind speed can affect the structure of the stratification in Lake Biwa. In general, the rise in air temperature and the decrease in wind speed weaken the vertical mixing, and strengthen the structure of the stratification, which interrupts the transport of the substances. However, how the change of each climate element can influence the structure of the stratification is not clarified. Therefore, it is important to distinguish the effect of each element on the stratification and evaluate them quantitatively. In the present study, we investigated the effect of the increase or decrease in air temperature and wind speed on the seasonal change of stratification in Lake Biwa by using a three-dimensional hydrodynamic model. Numerical simulations were carried out for a baseline case using realistic meteorological data from 2007 to 2011 and experimental cases using meteorological data with modified air temperature or wind speed for sensitivity analysis. The analysis showed that the rise and decrease in air temperature changed the vertical water distribution uniformly in almost all layers. As a result, the strength of the stratification hardly changed. The increase and decrease in wind speed, however, changed the structure of the stratification. The increase in wind speed made the water parcels of the surface layer well mixed, and the decrease in wind speed made the mixed layer and thermocline thinner.

Keyword: Lake Biwa, hydrodynamic model, structure of stratification, and impacts of climate change

O2-5 SUSTAINABILITY CHALLENGES IN EGYPT UNDER LIMITED AND THREATENED WATER RESOURCES

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The water deficit that increases rapidly and the degradation of the irrigation network in Egypt resulted in serious irrigation problems and in higher dependence on the drainage water at tail end regions. During last decades and due to the degradation of the drainage water and the spread of the municipal water stations on the main canals, the strategy of the dependence on the drainage water has changed. The reuse has started in Egypt through mixing the drainage water with the fresh water in the main canals (official reuse). Currently, the trend changed to the direct dependence on the drainage water at the tail ends, where there is no municipal stations; either through lifting the drainage water to the tail ends of the branch canals (intermediate drainage reuse), or through direct use of the drainage water by the farmers (unofficial drainage reuse). With the operation of Grand Ethiopian Renaissance Dam, the Egyptian water resources will decrease, and this will have serious impact of the sustainability of agricultural sector. Currently, the per capita share of water is around 600 m³/year. With the reduction of the irrigation water, the salinity of agricultural drainage water and the concentration of sewage and industrial wastes that are dumped in the drainage network will increase. In the same time, the dependence on the drainage water will increase. The situation might be critical during the coming years unless a new strategy is developed to enhance the quantitative and qualitative equity of water distribution and to ensure the sustainability

Keyword: water quality problems and pollution concerning water use, wise use and development of water resources

Technical Session 2: Sustainable Use of Freshwater Resources Section 2: Environmental Change Impacts on Water Resources
O2-6 CLIMATE ACTION IN LAKES OF HAOR BASIN OF BANGLADESH

Sanowar Hossain

Bangladesh POUSH

The Haor is a form of a back swamp, a bowl shaped shallow depression found in the north-east part of Bangladesh. Haor basin the second most climate change vulnerable ecosystem in Bangladesh. The people gain their livelihoods from wetland and floodplain resources. During monsoon, the whole area goes under water and there is no option in engaging earning activities except fishing. The rainfall pattern of the basin has changed and first flash flood is around two week ahead comparing with last decade. While flooding enhances floodplain fisheries, the early flashfloods, unique to this region, caused due to sudden onrush of rainwater from adjacent Indian Hills poses a high risk of damage to the standing crop just before harvesting. Data reveal that rainfalls in Meghalaya, India have increase in March and April that intensifies the severity of flashfloods. Submergible dykes to delay flashflood entry into crop fields is an action from the government. The community is diversifying the cropping. Building resilience into both human and ecological systems is the best possible way to deal with climate change risk. Climate response capacity and social acceptance build social and ecological resilience. The cross-sectoral multi-scale stakeholder engagement of the actors who influence or who are affected by the complex human-ecosystem interactions is the way towards building the social acceptance in an ecosystem. The current paper is based on observation of climate change impact and coping practices in the Haors of Moulvibazar and Sunamgang districts in the year 2017.

Keyword: Climate Action, Haor Basin, Adaptation, Institution, Policy

O2-7 THE LAKE FUND OF RUSSIAN FEDERATION, SPATIAL HETEROGENEITY AND ESTABLISHED TRENDS

Anna Izmailova

Institute of Limnology Russian Academy of Sciences

The results of estimation of the Russian Federation (RF) lake fund, carried out according to an original methodology involving modern satellite information, are presented. According to the assessment, ~3,900,000 water bodies of various origins are identified within the RF, the water resources of the water bodies of natural origin are estimated at ~25,910 km³ of water, of which 91% is in Lake Baikal. In the artificial water bodies the reserves of waters are about 890 km³. In spite of the huge lake water resources, their spatial distribution is extremely uneven and is weakly coordinated with the location of the population and industrial and agricultural production. The scarcity of water resources in the economically developed regions is usually overcome by the active construction of artificial reservoirs, which, as the analysis shows, is often accompanied by a decrease in the areas of natural water bodies. Quantitative changes in the lake fund are still localized. At the same time, the downward trend in natural water bodies fund in the most developed parts of the country is quite clear and can be intensified by climate change.

Keyword: water resources, lake fund, lake water, federal districts

O2-8 INTEGRATED MANAGEMENT APPROACH OF SELANGOR DAM AND EX-MINING POND TO TO MITIGATE EL-NINO EFFECT ON WATER RESOURCES IN SELANGOR, MALAYSIA

Mazlan Bin Idrus, Nor Zamri Sondor, Ahmad Faidz Razalli

Selangor Waters Management Authority

Sungai Selangor Dam is among of seven dams in Selangor State together with ex-mining ponds located along Selangor River which are gazetted as Protected Zone under Section 48, Selangor Water Management Authority (SWMA) Enactment 1999. Management of the dam is inclusive of impounding water body and water catchment area to ensure the water resource security. Both dams and ex-mining ponds are functioning as water supply to the nearest Water Treatment Plant. Sungai Selangor Dam have been established in the basin to regulate the river flow and ensure sufficient amount of water is available to all even during dry seasons. LUAS monitor the water quality as well as water level and report regularly to the State of Selangor. Water resource from the ex-mining ponds are utilized by pumping from the ponds to the Selangor River. The total capacity that can be abstracted from the ponds is 1,000 million litres per day (MLD). The utilization of the ponds has been proven to reduce the dependency on the release of water from Selangor River Dam thus can increase the storage life of the dam. Weekly monitoring of the water quality from the ponds is also implemented to ensure that the raw water quality meets the Malaysian National Raw Water Quality Standard. Other initiative undertaken by the SWMA is the cloud seeding operation over the catchment areas of the 7 dams in the state of Selangor inclusive of Selangor River Dam. The cloud seeding operation is conducted daily depending on the meteorological conditions to increase the possibility and intensity of rainfall thus increasing the storage of the dams.

Keyword: ex-mining ponds, Sungai Selangor Dam, water quality

Technical Session 2: Sustainable Use of Freshwater Resources Section 4: Watershed Change and Water Resources**O2-9 IMPACT OF LULC CHANGE ON HYDROLOGICAL RESPONSE IN LAKE MANINJAU CATCHMENT AREA**Iwan Ridwansyah¹, Luki Subehi¹, Meti Yulianti¹, Endra Triwisesa¹, Kenlo Nasahara²¹Research center for limnology, Indonesian Institute of Sciences, ²Graduate School of Life and Environmental Sciences, University of Tsukuba

Lake Maninjau belongs to the type of volcanic lake in the form of caldera lake. Its eruption spouted 220-250 km³ of volcanic herb spread over 75 km from the center of the eruption. This lake has a very small ratio of watershed and lake, where Maninjau watershed reaches 13,260 Ha and lake surface area 9,737.5 ha. Currently the water quality of the lake is decreasing due to the development of floating cage in the lake, but the change of land use in the catchment should also be considered, which can lead to changes in lake hydrological conditions. Based on classification on Landsat-8 Satellite image. Land use is dominated by agricultural area of 5,355.4 ha (37.8%); residential area of 216.9 ha (1.53%); forest area of 6,737 ha (47.4%); and the shrub and open area of 1,861 ha (13.1%). Land use changes may impact the hydrological characteristic such as water yield, surface runoff and base flow. The purpose of this study is to analyze the impact of land use changes on hydrological response in Lake Maninjau Catchment Area. SWAT hydrology model was used to assess the impact of land use changes from 1991 to 2018. The analysis of land change shows a reduction of forest area by 2.2%, 1.1% agriculture and 0.3% settlement increase. The SWAT model simulation results under land use conditions 1991 and 2018 showed the addition of surface runoff from 54 mm/year to 55 mm/year. While base flow is reduced from 406 mm/year to 334 mm/year.

Keyword: Land use change, Lake Maninjau, Hydrology response, SWAT, model**O2-10 SUSTAINABLE DEVELOPMENT OF LOCAL COMMUNITY THROUGH LAKE ECONOMY**Mangesh Kashyap

Society for Environment Education Research and Management (SEERAM), Maharashtra, Pune

The Importance of Lakes. Healthy lakes and their shores not only provide us with a number of environmental benefits, but they influence our quality of life and they strengthen our economy. Lakes can also be used as a water supply for industry and an irrigation source for agriculture. We can consider Lake as fresh water resource. All great civilization in the human history flourished alongside lake or rivers. This was because of availability of fresh water easily for daily activities, and fertile land available for agriculture. India's huge water resources have helped in sustaining the agricultural output necessary to support a huge population.

Keyword: Economy, lake, Sustainability, Pollution**O2-11 EFFECT OF SOIL TYPE, SLOPE AND LAND USE CHANGE ON SEDIMENT LOAD IN TONLE SAP LAKE BASINS**Michitaka Sato

Tokyo Institute of Technology

Environmental factors such as soil type, slope and land use type are considered to have significant impact on the sediment erosion and production in the river basin. Understanding their effects on the sediment erosion and sedimentary process is crucially important in sediment erosion management and control. These effects of environmental factors have not been investigated in distributed and quantitative manner in river basins in Southeast Asia. Therefore, this study aims to assess the effect of shifting of environmental factors affecting sediment loads using a physical-based sediment model. A distributed hydrological model was coupled with a process-based distributed model describing soil erosion and sedimentary processes at hillslope units and channels and applied in two rivers of the Tonle Sap Lake basin located in Southeast Asia. The calibrated model was applied to assess the effect of soil type, slope, and changing land use (2000-2014) on the sediment load. River basins which have just only one soil type or lower slope river basins tend to produce higher sediment loads compared to some kinds of soil type or have a higher slope. Changing in land use, specifically forest cover, resulted in increase of sediment load in all rivers (about 15%). The findings were useful for soil and land use management, agricultural practices and environmental management in the Tonle Sap Lake basin. The findings are also, in many cases, be likely extended to other river basins around the world which have similar environmental conditions or serve as useful cases for comparison with different environmental conditions.

Keyword: sediment yield, soil type, slope, land use change, Tonle Sap Lake basin

O2-12 THE EFFECTS OF CLIMATE CHANGE TO THE MAJOR SURFACE WATER RESOURCES AND TREATMENT FACILITIES IN THE WESTERN PART OF METROPOLITAN MANILA, PHILIPPINES

Benjamin Villa

Maynilad Water Services, Inc.

From the recent years, the Philippines already experienced the effects of climate change such as facing numerous typhoons with record-breaking amounts of rainfall and severe drought in some areas. However, direct impacts of climate change to the major surface water resources, specifically in the country's capital city, are seldom being discussed. Hence, this proposal will talk about the current scenarios of Metro Manila's two major water sources, Angat Dam and Laguna Lake, and how climate change will affect the water quality as well as the current setups of water treatment facilities. Currently, Maynilad, the company tasked to deliver water in the western part of Metropolitan, Philippines, is investing an estimated amount of at least USD 135M to provide safe and potable water to over 9 million customers. Upgradation of plants requires both minor and major changes on its treatment processes. Some of the solutions are specific to the process train that would directly treat a certain parameter that was considered in the design but has to be updated due to the effects of climate change. These water quality parameters include turbidity, total suspended solids (TSS), manganese (Mn), taste-and-odor (T&O) and total dissolved solids (TDS), among others. Previous actions to lessen the effects of climate change were quite successful. But since climate change seemed to be "normal" globally, Maynilad opted to address the challenge through long-term solutions.

Keyword: effects of climate change, water quality, effects of sediment, hypoxia, eutrophication

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments Invited Lecture**TS3-1 THE INTERACTIONS BETWEEN EUTROPHICATION, DAMMING AND CLIMATE CHANGE ON THE ROLE OF INLAND AQUATIC SYSTEMS IN THE GLOBAL CARBON CYCLE****Yves Prairie**

UNESCO Chair in Global Environmental Change, Department of biological Sciences, UQAM, Montreal

Lakes and rivers of the world are subjected to multiple and simultaneous environmental changes. How these changes have already affected the greenhouse gas footprint of lakes is largely unknown and even less can be predicted for the future. In this paper, we will use intermediate climate change scenarios from the IPCC as well as projected human population growth to assess their likely combined effects of GHG emissions. For the Asia-Oceania region, our simulations suggest that inland waters will respond to these environmental pressures with substantial increases in GHG emissions, in particular for methane (about 60%). The role of lakes on the global C cycle is therefore changing and constitute an additional source of GHG to the atmosphere.

Curriculum Vitae**Academic qualifications:**

1982	B.Sc.	Marine biology	McGill U., Montreal
1987	Ph.D.(Dean's honor list)	Limnology	McGill U., Montreal

Professional positions:

1987-1988	Post-doctoral fellow	Limnological Institute, U. of Constance, Germany
1988-1992	Assistant Professor	UQAM
1992-2000	Associate Professor	UQAM
1993-1996	Vice-President	Society of Canadian Limnologists
1994-1995	Visiting scientist	Centro de Estudios Avanzados de Blanes, Spain
1997-1998	Directeur adjoint, dép. Sc. biol.	UQAM
1999-2008	Director	GRIL Research Centre
1999-2002	President	Society of Canadian Limnologists
2000-present	Full Professor	UQAM
2001-2002	Visiting scientist	IMEDEA, Mallorca, Spain
2009	Visiting Scientist	Institute of Ecosystem Studies, Pallanza, Italy
2010-2012	Head of Department	Biological sciences, UQAM
2013	President	International Society of Limnology (SIL)
2016	Visiting Professor	Université Paul Sabatier. Toulouse. FR
2017	Visiting Professor	École Polytechnique Fédérale de Lausane, CH

Employment record:

1988-present, Université du Québec à Montréal (UQAM)

Research summary:

My main area of research looks at the interaction between carbon and nutrient biogeochemistry in freshwater aquatic systems, from local processes to their global significance. I am particularly interested in the role of human activities in altering these interactions and combines measurements relevant to ecosystem-level processes and the statistical modelling of lake functioning across large spatial areas.

TS3-2 A UNIQUE MICROBIAL LOOP IN THE HYPOLIMNION OF LAKE BIWA WITH SPECIAL REFERENCE TO LONG-TERM CHANGES IN WATER QUALITY



Shin-ichi Nakano¹, Kazuhide Hayakawa², Yoshikuni Hodoki¹,
Yusuke Okazaki¹, Indranil Mukherjee¹, Shoji D. Thottathil³,
Hiroyuki Takasu⁴, Shohei Fujinaga¹

¹Center for Ecological Research, Kyoto University, ²Lake Biwa Environmental Research Institute, ³Université du Québec à Montréal, ⁴Nagasaki University

We have clarified the presence of a unique microbial loop in the hypolimnion of Lake Biwa, the largest freshwater lake in Japan. In the epilimnion of the lake, phytoplankton biomass is produced through primary production, followed by sinking into the hypolimnion. In the hypolimnion, a part of the phytoplankton biomass is converted into and released as humic-like DOM through decomposition by planktonic bacteria. Fluorescence *in situ* hybridization (FISH) showed that bacterial clade, CL500-11 (phylum *Chloroflexi*), predominated in the hypolimnion. We made further analyses on prokaryotic community composition by high throughput 16S rRNA gene amplicon sequencing which showed the dominance by members of *Planctomycetes* exclusively occurred in the hypolimnion. In addition, FISH on eukaryotes showed that bacterivorous kinetoplastid flagellates are the dominant eukaryotes in the hypolimnion. So, the results suggest the presence of a unique microbial loop in the hypolimnion of Lake Biwa, where humic-like DOM is produced by the hypolimnion bacterial assemblages, and those bacteria are grazed by the dominant kinetoplastids and other hypolimnion dwelling bacterivorous protists. The water quality of Lake Biwa has been improved during the last 40 years. However, chemical oxygen demand (COD_{Mn}) in the lake has been gradually increasing every year. In the present talk, we will introduce the hypolimnion microbial loop, with special reference to long-term increase in COD_{Mn} of the lake.

Keyword: Eutrophication, Chemical Oxygen Demand, Dissolved Organic Matter, Phytoplankton, Bacteria, Decomposition, Microbial loop, Protists

Curriculum Vitae

April 1994:	Researcher, Lake Biwa Institute
October 1996:	Associate Professor, Faculty of Agriculture, Ehime University
April 1999:	Associate Professor, Center for Marine Environmental Studies, Ehime University
August 2006:	Professor, Faculty of Agriculture, Ehime University
April 2008:	Professor, South Ehime Fisheries Research Center, Ehime University
October 2008:	Professor, Center for Ecological Research, Kyoto University
April 2013 to present:	Director, Center for Ecological Research, Kyoto University

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments Section 1: Water Quality Restoration Technology**O3-1 APPLICATION OF NON-POWERED WATER CIRCULATION SYSTEM USING WIND AND WIND-DRIVEN CURRENT FOR SHALLOW RESERVOIRS**Yeoju Jang¹, Hyunman Lim², Jinhong Jung², Jaerho Park², Weonjae Kim²¹University of Science and Technology (UST, KICT school), ²Korea Institute of Civil Engineering and Building Technology (KICT)

A large number of reservoirs in Korea have experienced severe deterioration of water quality due to eutrophication. The problems include (1) inflow of pollutants, (2) occurrence of algal blooms, (3) increased oxygen consumption and anaerobic condition near the bottom, and (4) elution of nutrients from the sediments. As more than 90% of reservoirs in Korea have average water depth less than 5 m, we need appropriate technologies coping with these situations. A non-powered water circulation system has been developed to improve water quality of reservoirs by inducing the descent flow of surface water using natural wind and wind-driven current. One of the functions of the system is to break thermal stratification and anaerobic condition near the bottom. Test-beds have been installed and operated at 2 reservoirs and monitored more than 1 year. The results have showed clearly that 1) continuous improvement of anoxic condition at deep layer (hypolimnion), 2) mitigation of DO supersaturation and 3) prevention of excessive increase of pH at surface layer (epilimnion).

Keyword: Water circulation, Eutrophication, Stratification, DO improvement, Water quality management of reservoirs

O3-2 OXYGEN NANOBUBBLE MODIFIED LOCAL SOIL (MLS) TECHNOLOGY FOR SEDIMENT REMEDIATION AND LAKE RESTORATIONGang Pan^{1,2}, Tao Lyu², Lei Wang¹, Honggang Zhang¹, Lei Bi¹, Minmin Pan¹¹Research Center for Eco-environmental Sciences, Chinese Academy of Sciences, Beijing, ²Nottingham Trent University, UK

Eutrophication, harmful algal blooms (HABs), and internal sediment release of nutrients represent increasing problems for public health, ecological restoration, and water quality worldwide. Modified Local Soil (MLS) materials are cost-effective in removing HABs at very large scale (Pan et al, Environ. Pollut. 2006, 141, 195; Environ. Pollut. 2006, 141, 201; Environ. Pollut. 2006, 141, 206; Environ. Sci. Technol. 2006, 40:1377; Environ. Sci. Technol. 2013, 47, 4555; Harmful Algae, 2011, 10, 381; J. Applied Phycology, 2016, 28, 357; Water Research, 2016, 97, 11; Water Research, 2016, 97, 19). MLS capping technology can reduce the release of nutrients or algae toxins from sediment and turn algal cells and the excessive nutrients in-situ into fertilizers for submerged macrophyte restoration in shallow water systems (Pan et al, Ecol. Eng. 2011, 37, 302; Environ. Sci. Technol. 2012, 46, 5077; Environ. Sci. Technol. 2015, 49, 426). MLS is also tested for manipulating nutrient limitation in natural water bodies (Pan et al., Water Research, 2016, 101, 25). Here, we report that surface oxygen nanobubbles can be loaded in MLS for effective and long-term remediation of sediment anoxia or hypoxia in deep water system (Pan et al, Sci Total Environ. 2018, in press). Combined with integrated management of external loads control, MLS technology can be used as environmentally friendly geo-engineering materials (Pan et al, Water Research, 2016, 97, 133; Environ. Sci. Technol. 2014, 48, 9977; J Environ. Sci. 2018, 65, 375) to achieve multiple functions for water quality improvement, sediment remediation, and ecological restoration.

Keyword: eutrophication; algal blooms; water blooms; water quality, sediment release; sediment loads, bottom dissolve oxygen; nitrification/denitrification; anoxia, hypoxia, ecological restoration; in-lake restoration technology; transparency, climate change

O3-3 REASONABLE SELECTION OF EXPERIMENTAL FIELDS AND EVALUATION METHODS FOR WATER PURIFICATION TECHNOLOGY

Tomohiko Yamagishi, Yuji Noguchi, Naohiro Kishida

Saitama-ken Environmental Analysis & Research Association

In closed eutrophic water areas such as lakes and marshes, the development of a surface bloom dominated by cyanobacteria causes water quality problems, such as deterioration of landscape, offensive odor, etc. Therefore, the effective and economical measures for water quality improvement are required for these problems. Regarding to this issue in Japan, the advanced environmental technologies which have been considered to be effective in order to solve this issue have already been commercialized by such a venture company. However, these technologies have not been utilized at the place where an environmental problem exists because the object evaluation about the environmental preservation effect has not been informed end users such as local governments, companies, and consumers. The Environmental Technology Verification (ETV) Program helps to facilitate the use of advanced environmental technologies. The third-parties which are neither the developers nor user of the said technologies objectively verify the environmental conservation effects of them in order to provide credible data for the end users. We have evaluated whether or not reasonable selection of experimental fields and evaluation methods for water purification technology are economic and fair. As an example of the ETV program, this paper reports the evaluation of water purification technologies for lakes and reservoirs field.

Keyword: Eutrophication, Cyanobacterial Blooms, Water Purification Technology, Evaluation Methods

O3-4 A FUNDAMENTAL STUDY OF THE BLUE-GREEN ALGAE COUNTERMEASURES BY WASHOUT EFFECT IN LAKES

Kakinuma Daiki¹, Tadashi Yamada²

¹Dept. of Civil and Environmental Engineering, Graduate School of Science and Engineering Chuo University, ²Dept. of Civil and Environmental Engineering, Faculty of Science and Engineering Chuo University

Algal bloom is a big problem that happens in lakes and reservoirs. Algal bloom is caused by blue-green algae and cyanobacteria increased and accumulated on the water surface. Blue-green algae thrive in warm, nutrient-rich water conditions in lakes, reservoirs with long retention times. The reason why blue-green algae become a problem is that: odors can be generated and leads to landscape deterioration at the time of decomposition. In addition, it can be harmful to livestock and human health due to its liver poison. There is the drastic countermeasures in Japan, like water conduction which means using the river water and reclaimed wastewater to flush water bodies that suffered from algae bloom. The purpose of this study is to propose a method to simply define the safest required volume of water in order to prevent blue-green algae from growing by flushing out them. We know that we can tell whether the blue-green algae will die out or not by comparing the algae's growth rate and the rotation rate. In other words, it is better to conduct water more quickly than the growth rate of blue-green algae. Then, we evaluated the applicability of this method by culture experiment about the blue-green algae.

Keyword: Blue-Green Algae, Water Purification, Eutrophication

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments Section 2: Lake Ecosystem Monitoring 1**O3-5 FLOOD PULSE IN A TROPICAL FLOODPLAIN LAKE AND ITS IMPLICATION ON AQUATIC HABITAT DYNAMICS: CASE STUDY IN THE SENTARUM LAKES AREA, KALIMANTAN - INDONESIA**

Hidayat Hidayat, Siti Aisyah, Riky Kurniawan, Iwan Ridwansyah, Octavianto Samir, Gadis Sri Haryani

Research Center for Limnology, Indonesian Institute of Sciences

The Lake Sentarum in West Kalimantan, Indonesia, refers to a complex of large and small floodplain lakes in the middle part of the Kapuas River system. Apart from its great ecological and economic importance, the Sentarum lakes complex and its catchment area are generally threatened by deforestation, fire, monoculture agroindustry, and pollution. The objective of this research is to establish the hydrological characteristics of the Sentarum lakes area and to reveal the dynamics of aquatic habitat resulted from changing water levels. The water level was measured using a pressure sensor, while rainfall data were obtained from the data portal of the Tropical Rainfall Measuring Mission. Inundation monitoring was carried out using a time-lapse camera. A hydrological model is used to simulate water levels beyond measurement period. Water quality and fish sampling were carried out representing the seasons. Vegetation observation was carried out by field observation as well as analysis using satellite images. Water level records show that the Sentarum floodplain lakes have two peaks of inundation period following the bimodal pattern of rainfall in the equatorial Kapuas catchment. This water level dynamics induced changes in water quality, nutrient availability, vegetation cover, and fish diversity found in the Sentarum lakes area. Despite its seasonal changes, water quality of Sentarum lakes is generally good and suitable for aquatic biota. The fish diversity of the Sentarum lakes is relatively higher during high water period.

Keyword: Floodplain lake, flood pulse, water level, water quality, fish diversity

O3-6 DISSOLVED OXYGEN PROFILES AND ITS PROBLEMS AT LAKE MANINJAU, WEST SUMATERA - INDONESIALuki Subehi¹, Iwan Ridwansyah¹, Takehiko Fukushima²¹Research Centre for Limnology, Indonesian Institute of Sciences, ²Ibaraki Kasumigaura Environmental Science Centre

In general, tropical lake in Indonesia is one of the unique ecosystems which are functioning in both ecological and economic services. The objective of this study is to analyze the dissolved oxygen profile of caldera tropical lake represented by Lake Maninjau at West Sumatera, Indonesia and its impact. Lake Maninjau, not only for fisheries culture, but also serves as important hydroelectricity power. Surveys at Lake Maninjau was conducted in August 2006, March 2014, September 2017 and April 2018. The results on the survey in Lake Maninjau showed that the average depth is 105 m. It covers 13,260 ha of area with a height of 461.5 m above sea level and maximum depth of 165 m. The lake water comes from rainfall, small rivers and the surrounding ground water and one outflow in Batang Antokan River. Based on the measurement results, it obtained that dissolved oxygen from the surface layer to a depth of 40 m (2006) has decreased to a depth of 12 m (2018), indicating the worse condition of water quality in 2018 compared with previous years. Currently, bad water quality and mass mortality fishes often occurred. Next, the percentage value of fish cages at Lake Maninjau in 2017 was 0.43%. Besides human activities, it suggested also that the potential impact from fish cages contributed pollutant concentration into this lakes. In order to maintain the sustainability of the lake, basic ecological information is necessary for the next study.

Keyword: water quality, dissolved oxygen, fish cage area, Lake Maninjau

O3-7 THE FORMATION OF THERMOCLINE AND ITS INFLUENCE ON WATER QUALITY AT A SUBAQUEOUS BORROW PIT IN LAKE SOTONASAKAURA

Keita Nakagawa, Shun-Ichi Matsumoto, Takehiko Fukushima

Ibaraki Kasumigaura Environmental Science Center

Subaqueous borrow pits are known to be sites of low dissolved oxygen concentration accompanied by phosphorus release, due to poor water exchange with the surrounding (better quality) water. Lake Kasumigaura has many subaqueous borrow pits left over from past gravel extraction, particularly in Lake Sotonasakaura, located in the southeastern part of Lake Kasumigaura, where large, subaqueous borrow pits were found. These pits have not been investigated to date and the authors therefore investigated their thermocline and water quality. In the selected research pit, a cycle of formation and break-up of thermocline was found, with thermocline break-up mainly occurring coincident with periods of cooler air temperature and strong wind. In addition, it was confirmed that when the thermocline formed, the dissolved oxygen concentration decreased at depth and PO₄-P exhibited raised values.

Keyword: low dissolved oxygen concentration, Subaqueous borrow pit, thermocline, water quality variation

O3-8 EFFECTS OF THREE GORGES DAM ON SPATIOTEMPORAL DISTRIBUTION OF SILICON IN THE TRIBUTARY: EVIDENCE FROM THE XIANGXI RIVER

Yonghong Bi, Yubo Huang, Wujuan Mi, Zhengyu Hu

Institute of Hydrobiology, Chinese Academy of Sciences

In order to get insight into the impact of dam construction on silicon distribution pattern due to the altered hydraulic and environmental conditions, the Xiangxi River was chose as the delegate of the tributaries in the Three Gorges Reservoir to screen the effects of the Three Gorges Dam on silicon distribution. Dissolved silica (DSi), biogenic silica (BSi) and lithogenic silica (LSi) were investigated monthly from November 2015 to October 2016, the hydrodynamic conditions were addressed synchronously. DSi was significantly lower in the wet season than the dry season, BSi and LSi were significantly higher in the wet season than the dry season. DSi was dominant component in the total silicon (>90%) and it has a relatively higher concentration in the upstream than the downstream in the main channel. BSi was higher in the upstream than the downstream. LSi was significantly higher in the upper tributaries than the main channel. Statistical analysis showed that DSi was linearly negatively correlated with water discharge. BSi concentration showed a negative correlation with DSi. Water velocity and discharge exhibited a positive correlation with LSi concentration. DSi had a negative correlation with Chl a while BSi had a positive correlation with Chla. The backwater area retained 2.59% bioavailable silicon (DSi + BSi). It was concluded spatio-temporal heterogeneity of silicon distribution related to hydrodynamics was determined by the regulation of dam, backwater area was the main deposition area for silicon.

Keyword: Silicon, Spatiotemporal distribution, tributary, Three Gorges Dam

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments Section 3: Lake Ecosystem Monitoring 2**O3-9 DIETARY UTILIZATION OF CYANOBACTERIA BY FISH COMMUNITIES IN LAKE HACHIRO**Megumu Fujibayashi¹, Souta Aomori¹, Yoshihiro Takada², Kunihiro Okano¹, Hitoshi Mizutani², Naoyuki Miyata¹¹Akita Prefectural University, ²Akita Prefectural Institute of Fisheries

Primary producers are generally carbon sources for consumers in a lake food web. However, some traits of cyanobacteria, such as floc formation and toxin production prevent primary consumers from feeding on cyanobacteria. In this study, dietary utilization of cyanobacteria by fish was examined in a shallow eutrophic lake, Lake Hachiro where nuisance algal bloom occur in every summer. Monthly sampling was conducted to collect fish and lake water from June to November, 2016. Fatty acid compositions of these samples were analyzed. In July, abundance of cyanobacteria started to increase, and cyanobacterial blooms were observed from August to October. From June to August, low level contribution of cyanobacterial fatty acid biomarkers (18:2 ω 6 and 18:3 ω 3) in these fish species was observed. This result indicate a low contribution of cyanobacteria to the diet during this time period. However, the contribution of cyanobacterial fatty acid biomarkers in these fishes increased in September, indicating these fish started to use cyanobacteria as dietary sources. These results imply continuous occurrence of cyanobacterial blooms may induce fish to utilize cyanobacteria as dietary sources in a eutrophic lake.

Keyword: Algal bloom, Eutrophication, Food chain**O3-10 CYANOBACTERIAL CARBON TRANSFER TO HIGHER TROPHIC LEVEL IN EUTROPHIC TAIHU LAKE**Xian Cao¹, Megumu Fujibayashi², Osamu Nishimura¹, Takashi Sakamaki¹, Munehiro Nomura¹¹Tohoku University, ²Akita Prefectural University

Cyanobacteria have been considered an inadequate food source due to a lack of vital nutrients, toxin production, and floc formation. This may interrupt carbon transfer to higher trophic level animals, including fishes. In this study, to elucidate the contribution of cyanobacteria for benthic animals in Taihu, we examined cyanobacterial carbon transfer in a eutrophic lake by using a fatty acid biomarker, stable carbon isotope ratios of fatty acid, and stable isotope ratios of bulk nitrogen. Terrestrial plant and animals (benthic animals, primary consumer) were collected via in July, from Lake Taihu, China. Combined dual stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) and fatty acid biomarkers, the results revealed that there were only subtle differences in the diets of benthic and pelagic animals and cyanobacteria were their main food source. Concomitantly, results of $\delta^{13}\text{C}$ of bacteria-specific fatty acids demonstrated that bacteria equally and profoundly affected organics accumulation or preservation in the sediments, because they preferentially utilized labile cyanobacteria as their carbon source instead of terrestrial plants (>95% within these two sources). Consequently, these novel findings clarify that not only in deep lakes, but also shallow eutrophic ones, the extensive losses of autochthonous organic matter can be expected during sedimentation coupling with the dramatical modifications of biogeochemical processes

Keyword: Cyanobacteria, algal blooms, carbon transfer, eutrophic lakes, fatty acid biomarker

O3-11 EFFECT OF pH NEUTRALIZATION ON PRIMARY PRODUCER DISTRIBUTION IN ACIDOTROPHIC LAKE INAWASHIRO

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Fukushima Prefectural Centre for Environmental Creation

Water quality has declined in acidotrophic Lake Inawashiro, where neutralization of pH has progressed in recent years, suggesting an increasing trend in primary production. In previous studies, changes in populations of aquatic weeds or phytoplankton were surveyed in limited areas. This study aimed to survey changes in phytoplankton and aquatic weeds corresponding to neutralization in pH over the entire lake. In all areas of Lake Inawashiro, the average annual values for pH increased in recent years, while the values for T-P increased in the northern and southern areas. These changes in environmental factors affected phytoplankton density and community composition in the entire area. On the other hand, factors other than pH may affect the distribution of aquatic weed.

Keyword: water pollution, primary production, eutrophication

O3-12 DEVELOPMENT OF A BLOOM FORECASTING MODEL FOR MICROCYSTIS IN TSUCHIURAI BAY, LAKE KASUMIGAURA, JAPANYumi Nagahama¹, Masami Abe², Shunichi Matsumoto¹, Takehiko Fukushima¹¹Ibaraki Kasumigaura Environmental Science Center, ²IDEA Consultants, Inc.

In past summers, *Microcystis* spp. bloomed at Lake Kasumigaura, especially in Tsuchiurairi Bay with its limited circulation. Ibaraki Prefecture has taken several measures to address *Microcystis* blooms, however they need a predictive model to help them develop causal treatments. First, the authors measured the volume, distribution, and seasonal variation of *Microcystis* in sediments from Tsuchiurairi Bay, using real-time PCR. The authors then constructed an ecosystem simulation model to examine the relationship of these data to *Microcystis* blooms. Results suggested that *Microcystis* cell recruitment occurred in early June in Tsuchiurairi Bay, however the results also suggested that cell transportation processes played a greater role in *Microcystis* blooms than the cell recruitment process. The authors then constructed a hybrid model that combined the ecosystem simulation model with the deep learning model of Convolutional Neural Network and applied a Variational Auto-Encoder system. The results calculated by this hybrid model forecast accurately for phycocyanin at several sampling stations in Tsuchiurairi Bay, and the authors contend that these initial results indicate there is a good possibility of using this hybrid model for forecasting *Microcystis* blooms at Tsuchiurairi Bay, Lake Kasumigaura.

Keyword: Microcystis bloom, Recruitment, Ecosystem simulation model, Deep learning, Public utilization

O3-13 WARMING AND EUTROPHICATION EFFECTS ON PHYTOPLANKTON COMMUNITY OF TWO TROPICAL SYSTEMS WITH DIFFERENT TROPHIC STATES - AN EXPERIMENTAL APPROACHSandra Maria Feliciano Oliveira Azevedo¹, Andreia Maria Da Anunciação Gomes², Marcelo Manzi Marinho³, Marcella C. B. Mesquita³, Ana Carolina C. Prestes³, Miquel Lurling⁴

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Global warming and eutrophication are predicted to promote cyanobacterial blooms but how tropical phytoplankton from different trophic state systems respond to temperature is less known. To explore the effect of temperature changes and nutrient addition on phytoplankton and to verify possible resistance to these effects, we conducted an experiment with phytoplankton from two aquatic ecosystems differing in trophic state. Water samples from a eutrophic and an oligo-mesotrophic systems were collected and incubated in 25 and 30°C. Treatments that received a surplus of N and P were included as eutrophication treatments. Temperature variation itself did not promote cyanobacteria growth in either water from the oligo-mesotrophic or the eutrophic system. However, nutrient enrichment of water from the eutrophic system significantly boosted cyanobacteria, and biomass increased 10 times in both 25°C and 30°C treatments. In contrast, eutrophication of water from the oligo-mesotrophic system did not change the relative contribution of phytoplankton groups and response ratios were much lower than those from eutrophic water. Although using a simple experimental design, the results suggest that in eutrophic systems cyanobacteria dominance can be favored by further addition of nutrients, independently of a direct temperature effect and that more pristine environments possess some resistance against eutrophication. Since global warming is assumed to intensify eutrophication indirectly, our study underscores the importance of nutrient control

Keyword: global warming, eutrophication, cyanobacteria blooms, trophic state

O3-14 EVALUATION OF THE DEGRADATION FUNCTION OF MICROCYSTIN-LR ON SEDIMENT COLLECTED FROM ISAHAYA NEW POND AND ISAHAYA BAYKakeru Ruike¹, Ryuhei Inamori¹, Yuhei Inamori^{1,2}¹Foundation for Advancement of International Science, ²NPO: Bio-Eco

Microcystin species (MCs) produced by toxic cyanobacteria has become a serious problem in the world. Up until the present, it has been focused on MCs degradation in freshwater bodies only, although all lakes and ponds connect to the sea. Therefore, the aim of this study was to estimate the behavior of MCs discharged from freshwater bodies to sea such as the degradation, through the degradation of MC-LR in surface-water combined with sediment collected from the Isahaya new pond and the Isahaya bay as a model for effluent source and discharged estuary. The result showed that no MCs have accumulated long-term in surface water and sediment of the Isahaya new pond as an effluent source to the Isahaya bay. Moreover, these both areas have a potential of a degradation of MC-LR lower than $0.01 \mu\text{g} \cdot \text{t}^{-1}$ for 17 days at 30°C and 21 days at 20°C. Interestingly, a sea water component had no effect. As a result of bacterial isolation, the decrease of concentration was probably caused by the degradation bacteria. These results supports that no MCs accumulate in the Isahaya new pond and the Isahaya bay, and thus it was strongly suggested no MCs was concentrated biologically into the aquatic organism via benthos. These results will contribute to the estimation of MCs behavior in sediment of the lake and estuary such as Lake Kasumigaura.

Keyword: Eutrophication, Water blooms, Microcystin-LR in sediment, Isahaya new pond, Isahaya bay

O3-15 INFLUENCE OF ENVIRONMENTAL FACTORS ON CYANOBACTERIAL BIOMASS AND MICROCYSTINS CONCENTRATION IN THE DAU TIENG RESERVOIR, VIETNAMLuu Thanh Pham¹, Son Thanh Dao², Dang Ngoc Tran³, Motoo Utsumi⁴¹Institute of Tropical Biology, Vietnam Academy of Science and Technology, ²Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam, ³University of Medicine and Pharmacy, Ho Chi Minh City, Viet Nam, ⁴Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan

Cyanobacterial blooms can be harmful to environmental and human health due to the production of toxic secondary metabolites, known as cyanotoxins. In the present study, we examined the effects of environmental parameters on cyanobacterial community structure and MCs concentrations in the Dau Tieng reservoir (DTR), a tropical, eutrophic water body in Southern Vietnam. Cyanobacterial biomass and MCs contents were monitored monthly from March 2012 to February 2013, when MCs were present in the DTR. The highest concentrations of intracellular MCs were found in September and February when cyanobacteria biomass reached maximum values, with 2.50 and 2.13 µg/L, respectively. Multivariate analysis showed that MCs concentration was positively correlated with the biomass of the cyanobacterial order Chroococcales, whereas total phosphorus (TP) was the primary abiotic factor influencing cyanobacterial biomass and MCs concentrations in the DTR.

Keyword: harmful algal bloom, eutrophication, cyanobacterial toxins, Dau Tieng reservoir Vietnam

O3-16 LIMNOLOGICAL CHARACTERISTICS, EUTROPHICATION AND CYANOBACTERIAL DOMINANCE IN THREE UGANDAN NATIONAL PARK SHALLOW LAKESWilliam Okello¹, Florence Grace Adongo², Lillian F.A. Idrakua², John Peter Obubu², Patrick Aria Omeja³¹National Fisheries Resources Research Institute (NaFIRRI), ²Directorate of Water Resources Management, Ministry of Water and Environment, ³Makerere University Biological Field Station

Water quality remains a major driver in lake ecosystem functioning. Illustrating these are limnological studies that in the tropics started in the second half of twentieth century. As it advances, interrelation and combination of physical, chemical and biological parameters in East Africa lakes started. The works centred on Lake Albert then Victoria shared between Kenya, Tanzania and Uganda. Uganda astride the equator is 18% covered by other lakes, rivers and wetlands besides Albert and Victoria. Three of these major lakes are Edward, George and Kyoga plus many crater lakes, small lakes and rivers. Among the five major lakes, Lake George was intensively studied in 1970 unlike lakes Edward and Mburo despite their equal water resources socio-economic development and value in supporting wildlife and conservation. We assessed the status of Lakes George; Mburo and Edward describing their physico-chemical, biological and environmental variables standard methods from May 2007 to April 2008. In conclusion, the factors that have driven changes in the other lakes: high nutrient concentration; high phytoplankton biomass dominated by harmful algal bloom unlike the current high pristine shallow lake ecosystem in Europe and America are discussed. Four decades later Lake George limnological conditions remained stable providing an insight of alternative states of tropical shallow lakes.

Keyword: lake ecosystems functions, water quality, nutrient dynamics, eutrophication, harmful algal bloom

O3-17 PROPERTIES OF CYANOBACTERICIDAL BACTERIA AND GROWTH INHIBITING BACTERIA ASSOCIATED WITH WATERWEEDS AGAINST *DOLICHOSPERMUM CRASSUM* (CYANOPHYCEAE) CAUSING MUSTY ODOUR PROBLEM IN DRINKING WATERTaketoshi Shimizu¹, Shiho Ebisu¹, Hironobu Ueshiro¹, Takuya Oda¹, Ichiro Imai²¹Water Quality Laboratory, Kobe City Water Works Bureau, ²Research Division, Lake Biwa Museum

The population dynamics of effective bacteria (cyanobactericidal bacteria and growth inhibiting bacteria) against the nuisance cyanobacterium *Dolichospermum crassum* were investigated at two habitats, the surface water of a reservoir and the waterweed zone (containing *Potamogeton malayanus* Miq.) of Lake Biwa. The number of effective bacteria associated with *P. malayanus* in the lake water in the waterweed zone greatly exceeded the number in the reservoir where algal blooms frequently occur. Trichomes of *D. crassum* were rapidly destroyed by effective bacteria when they were co-incubated with a biofilm from *P. malayanus* or water from the waterweed zone of Lake Biwa. The effects of other predators and chemicals were negligible, and it is concluded that waterweed beds play a significant role in preventing *D. crassum* blooms as providers of effective bacteria. Possible control of *D. crassum* blooms was discussed in relation to effective bacteria as feasible prevention strategies for the nuisance cyanobacterial blooms in water environments.

Keyword: Water Quality Management, Cyanobacterial bloom

O3-18 “ECOSYSTEM HEALTH ASSESSMENT OF POWAI LAKE, MUMBAI, INDIA”Pramod Bhagwan Salaskar¹, Eknath Muley²¹Dr M.S. Kodarkar Field Station, Powai Lake, Mumbai, ²Indian Association of Aquatic Biologists, India

Powai lake is an important ecological landmark on the map of megacity with more than 2 billion population of Mumbai that provides the citizens an opportunity for some recreation and natural ambience. The lake has an unique location with reasonably well protected catchment having Indian Institute of Technology and Sanjay Gandhi National Park.

Powai Lake is one of the best studied freshwater ecosystems in this region and a good record of its water quality over a period of time is available. Relatively higher values of dissolved solids, nitrates and phosphates as well as COD and BOD and primary productivity along with significant decrease in transparency in Powai lake indicates hyper eutrophic conditions. This is further corroborated with symptoms such as foul odors, prolific growth of water hyacinth (*Eichornia crassipes*) and blooms of blue green algae (*Microcystis* sp.) with recurrence of mass mortality of fish species. If appropriate measures are taken, the lake can be revived for future sustenance of the lake itself, supporting ecosystem and for the benefit of the lake dependent community as a whole.

Keyword: Powai lake, Water Quality, Eutrophication processes, Conservation, Algal bloom

O3-19 THE INFLUENCE OF EUTROPHICATION ON METHANE PRODUCTION AND ITS POTENTIAL AS A CARBON SOURCE FOR ZOOPLANKTONMichal Rybak², Sławomir Cerbin¹, Aleksandra Petechata¹, Maciej Bartosiewicz³, Paul Bodelier⁴¹Department of Hydrobiology, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Poznań,²Department of Water Protection, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Poznań, ³Biogeochemistry, Department of Environmental Sciences University of Basel, Switzerland, ⁴Department of Microbial Ecology, Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Methane constitutes a minor part in entire greenhouses emission, nevertheless its global warming potential is 20-30 times higher than carbon dioxide. Moreover, methane production and emission increases with eutrophication, and it has been demonstrated to serve as a carbon source for pelagic food webs. The methane oxidising bacteria (MOB) are the only group, which is able to utilize methane, as their sole source of carbon and energy and make a link between methane producers and higher food chain levels. However, the environmental controls of this alternative carbon source for plankton community in lakes with different trophic statuses are still poorly understood. Here we evaluated differences in fluxes of CH₄ and its potential as a carbon source for zooplankton in relation to the trophic state of two lakes. For this purpose two morphologically similar lakes with different trophic levels were investigated to determine methane efflux as well as zooplankton community structure and carbon stable isotope ratios in order to determine sources (¹³C/¹²C). The results revealed that C-CH₄ is incorporated into zooplankton through MOB community. Based on literature C-CH₄ has lower share of total carbon built into zooplankton in environments with higher trophic. However, our result showed that this process is more sophisticated and depends on food selectivity and vertical distribution of zooplankton members.

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Keyword: lake ecosystems functions, eutrophication, effects of climate change

O3-20 LONG-TERM VARIATION OF CO₂ FLUX AND THE CONTROLLING FACTORS IN ASIA'S LARGEST BRACKISH WATER SYSTEM, CHILIKA LAKEPradipta Ranjan Muduli¹, Alaya Tarak Behera¹, Prasannajit Acharya¹, Ajit Kumar Pattnaik²¹CHILIKA DEVELOPMENT AUTHORITY, WETLAND RESEARCH AND TRAINING CENTER, ²WETLANDS INTERNATIONAL SOUTH ASIA

Carbon dioxide (CO₂) is one of the greenhouse gas known to be the main driving factor of global warming; however, the role of the coastal ecosystem on global CO₂ fluxes remains unclear due to lack of adequate data. With an objective to bridge this knowledge gap, an estimation of CO₂ flux was made analyzing the 19 years data (1999-2018) from 30 sampling locations covering entire Chilika Lake, India. ANOVA test revealed a significant variation of CO₂ flux with respect to regions as well as seasons. The overall positive value of CO₂ flux indicates Chilika Lake acts as a source of CO₂ to the atmosphere. The northern region (NR) recorded highest release of CO₂, followed by the inlet (IR), central (CR) and southern region (SR). A significant relationship between apparent oxygen utilization (AOU) and excess DIC (dissolved inorganic carbon) in the NR indicates biological respiration is the major factor for rapid ventilation of CO₂ to the atmosphere. The sink of CO₂ and minimal C source in the SR could be attributed to the presence of seagrass bed and dominate primary productivity. The C estimation from this long-term data set (8.27x10⁻⁶ PgC Y⁻¹) indicates, Chilika contributes ~ 0.0019%C to global C emission to the atmosphere. The trend obtained through 19 years of monthly data indicated a significant annual increase of pCO₂ (µatm) and CO₂ flux (mmol m⁻²d⁻¹) which are 1.57 & 0.048 respectively. At the same time, a significant decrease in pH @ 0.0006/year was observed which supports the phenomena

Keyword: lake ecosystems functions, water quality, primary production, climate change, degradation

O3-21 REGIME SHIFT ANALYSIS FOR UNDERSTANDING THE WATER QUALITY DYNAMICS IN LAKE KASUMIGAURAAyato Kohzu¹, Shin-ichiro Matsuzaki², Shunsuke Komuro³, Shun-ichi Matsumoto³, Kazuhiro Komatsu¹, Noriko Takamura⁴, Megumi Nakagawa², Akio Imai⁴, Takehiko Fukushima³¹Center for Regional Environmental Research, National Institute for Environmental Studies, ²Center for Environmental Biology and Ecosystem Studies, ³Ibaraki Kasumigaura Environmental Science Center, ⁴Biwako Branch, National Institute for Environmental Studies

Regime shift analysis is one of the way of time series analysis. In regime shift analysis, we are detecting the existence and the timing of "regime shift" that is defined by "abrupt and rapid transition between different states that continue for much longer periods". Some changes in lake ecosystems are recognized as "Regime shifts". When there are the close relationships between environmental factors and the parameters, we could expect the good correspondence between the regime shift timings of factors and parameters. Based on this idea, we conducted regime shift analysis on the data set from meteorological to lake environmental parameters. Some of the regime shift found in the biological and chemical parameters of Lake Kasumigaura well corresponded to the highly turbid periods from latter half of '90s to the first half of '00s.

Keyword: time series analysis, regime shift analysis, climate parameters, water quality parameters

O3-22 A STUDY OF THE FACTORS OF THE CHANGE OF WATER QUALITY AND THE VERTICAL CIRCULATION OF ALL LAYERS IN LAKE IKEDA

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The vertical circulation of all layers in Lake Ikeda was recognized for the first time in these 6 years, in February, 2018.

The change of the water quality in the Lake Ikeda was analyzed by Dissolved Oxygen(DO) and from the findings of the water temperature.

According to the results of DO, it was 5 times, 1984, 1986, 2011, 2012 and 2018 that the vertical circulation was recognized after 1983, when the investigation into bottom layer (200m) started.

The average temperature difference between the surface and the bottom was less than or equal to 0.2°C when the vertical circulation was recognized, and it seems that one of its factors is the temperature in January and February, and the temperature in January influences more.

Keyword: vertical circulation, water quality management, climate change

03-23 STUDY ON SIMILARITY OF COD FLUCTUATION IN LAKE KASUMIGAURA AND LAKE TEGANUMA

Daiki Terashima¹, Daiki Kakinuma¹, Syo Watanuki¹, Tadashi Yamada²

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Lake Kasumigaura, Teganuma and Inbanuma are lakes located in an area with the same meteorological conditions, total catchment areas are with a radius about 30 km². Lake Kasumigaura is a symbol of Tsuchiura City, the second largest lake in Japan. On the other hand, Lake Teganuma and Inbanuma are located in Chiba Prefecture and are used as a place for people's relaxation. Moreover, it is used as drinking water in Lake Inbanuma and important water resource for people. Although they are independent lakes, and external factors are influenced to fluctuations COD, but the annual values of COD are similar to over the years. Therefore, in this study, we analyzed COD fluctuation for Lake Kasumigaura and Teganuma that have 1-hour COD data. As a result, clear variations in COD fluctuations are found, indicating that the COD is fluctuating due to external factors. It is necessary to consider the fluctuation of COD value due to external factors in analyzing the water quality influenced by dredging and purification water guidance conducted in the lake.

Keyword: Water pollution, Water quality management

03-24 ASSESSMENT OF ORGANIC MATTER INDICATORS IN LAKE BIWA

Kazuhide Hayakawa¹, Yoshinori Hirose^{1,5}, Takahiro Okamoto¹, Takamaru Nagata¹, Yuichi Sato¹, Akio Imai², Noriko Tomioka², Kazuhiro Komatsu², Kenji Tsuchiya², Shin-ichi Nakano³, Yoshikuni Hodoki³, Naoshige Goto⁴, Teruko Tanaka⁵, Masato Asami⁵, Naoki Komatsu⁵

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COD is an environmental quality standard in rivers and lakes, and has played a significant role in water pollution prevention, but it is subject to rethink conventional wisdom. In this study, we compared COD and TOC data from the monitoring survey of Shiga Pref. in Lake Biwa. As a result, we confirmed that the COD values of lake water have no difficulty to detect pollution level of organic matter, but they have a problem as the indicator of absolute amount of organic matter. As the organic pollution of river and lake waters has reduced owing to the prevention of pollution load from the watershed, the internal production of lakes is major source of organic matter. For future measures of lake conservation, we should comprehend the mass balance of ecosystems in order to elucidate the above-mentioned problems including the problem of ecological weakening, such as increase of invasive fishes, overgrowth of aquatic plants, remarkable decrease of native fishes and bivalves.

Keyword: Water quality preservation, Management of organic matter pollution, COD(Mn), TOC

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments Section 8: Sediment and Primary Production

O3-25 ANALYSIS ON SEDIMENTARY MECHANISM OF ORGANIC MATTER IN THE COASTAL AREA OF LAKE IZUNUMA

Munehiro Nomura, Fumiya Fujimaki, Osamu Nishimura

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The water quality of lakes is lower than that of rivers and oceans. One cause of this disparity is the relatively high internal loading of pollutants, including organic matter, that may be accumulated in the sediment. In order to develop useful technologies to reduce pollution in lake sediments, this research sought to clarify the mechanisms by which organic matter accumulates in sediments. Based on the hypothesis that flow regulates the total amount of organic matter in lake sediments through weathering, sedimentation, and resuspension, we simulated the amount of organic matter accumulation in sediments. From this simulation, we investigated the possibility that technologies capable of controlling flow may improve sediment quality. Our results suggest that the accumulation of organic matter in lake sediments is dominated by flow.

Keyword: Water Pollution**O3-26 NUTRIENTS AND MOLAR C:N:P RATIOS IN SURFACE SEDIMENTS OF THE SONGKHLA LAGOON SYSTEM IN SOUTHERN THAILAND**

Vachira Lheknim

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Information pertaining to temporal and spatial variations in nutrients concentrations in the surface sediments of the Songkhla Lagoon system is limited. Therefore this study aimed to examine the proportion of silt and clay and total carbon, nitrogen and phosphorous concentrations in the surface sediments from the windward and leeward sites of Thale Sap and Thale Sap Songkhla in the Songkhla Lagoon system between August 2017 and March 2018. Samples taken from leeward shores exhibited significantly higher proportion of silt and clay. The sediments of Thale Sap were characterized by higher concentrations of carbon and nitrogen, owing to the colonization of aquatic macrophytes within this lake. The phosphorous concentrations were relatively high in the sediments of Thale Sap Songkhla, owing to the proximity of this lake to discharge sources such as urbanization, industries, and human settlements. The sediments of Thale Sap had a relatively higher molar C:N:P ratios (437:43:1) than that of the sediments of Thale Sap Songkhla (233:23:1).

Keyword: sediment nutrients, coastal lagoon, Songkhla Lagoon system, Thale Sap, Songkhla Lake**O3-27 PHYTOPLANKTON COMMUNITIES AND WATER QUALITY CHARACTERISTICS IN LAKE PALDANG, SOUTH KOREA**

Jongkwon Im, Hunnyun Kim, Younbo Sim, Seokjae Youn, Yongjin Kim, Mina Yu, Jeonghwan Byun, Junsoo Baek, Younghun Jin, Myeongseop Byeon, Soonju Yu

Han River Environment Research Center, National Institute of Environmental Research

The present study carried out the temporal characteristics and variation of phytoplankton diversity, composition and their abundance with water quality using statistical techniques in Lake Paldang, South Korea. A total of 91 species of phytoplankton were identified from the Lake Paldang in 2016, belonging to 6 functional groups i.e., Chlorophyta(35 species), Bacillariophyta(34), Cyanophyta(11), Ochrophyta(5), Cryptophyta(4), and Miozoa(2). Throughout the study period, the occurrence of most dominant species was observed from Bacillariophyta(*Stephanodiscus hantzschii* and *Cyclotella atomus*). The performed statistical analysis on phytoplankton species, the evenness and Shannon-wiener diversity index were found to be higher in winter than those of spring. PCA applied to compare the compositional patterns among the analyzed water samples, identified and four factors accounting for almost 84.4% of the total variation representing water compound concentration are mainly related to point and non-point source as well as natural process. We therefore suggest wise management of anthropogenic activities in the catchment of Lake Paldang and their tributaries.

Keyword: Lake Paldang, Phytoplankton, Environmental index, Trophic state, Component analysis

O3-29 DEGRADATION OF BISPENOLS IN THE *PHRAGMITES AUSTRALIS* RHIZOSPHERE

Miki Nakai

University of Osaka

Bisphenol A (BPA) and relevant chemicals such as bisphenol F (BPF) are industrially important chemicals. However, these chemicals are also known to possess endocrine disrupting activity and thus recognized as important hazardous pollutants that may pose negative impact on aquatic ecosystem. Toward understanding the behaviors of BPs in the aquatic environment, this study investigated the fates of BPA and BPF in the presence of *Phragmites australis*, which is used as the model aquatic plant because it distributes world widely in lakes and wetlands and is known to possess water purification and ecological conservation abilities. BPs degradation experiments conducted in this study found the accelerated removal of BPA and BPF, especially BPA, in the co-existence of bacteria and *P. australis* compared with in the absence of the plant. Microbial community analysis also revealed the enrichment of specific bacteria, which may contribute to the degradation of BPA and BPF, and the increase of bacterial diversity in the rhizosphere of *P. australis*. The results of this study suggested that the existence of *P. australis* may play a significant role in the degradation of BPA and relevant chemicals and the conservation of microbial diversity in the presence of those hazardous pollutants in the aquatic environment.

Keyword: bisphenols, *Phragmites australis*, rhizobacteria, degradation

O3-30 DETERMINATION OF CHELATORS IN LAKE WATER USING ULTRA-PERFORMANCE LIQUID CHROMATOGRAPHY/QUADRUPOLE TIME-OF-FLIGHT MASS SPECTROMETRYSohag Miah¹, Ismail M. M. Rahman², Shohei Fukiage¹, Asami S. Mashio³, Teruya Maki³, Hiroshi Hasegawa³

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The determination of chelators in environmental samples is an analytical challenge due to their structural similarities and presence of low concentrations. We report a rapid and sensitive method for the determination of both the non-biodegradable (ethylenediaminetetraacetic acid, EDTA; N-(2-hydroxyethyl)ethylenediamine-N,N'-triacetic acid, EDTA-OH) and biodegradable (ethylenediamine-N,N'-disuccinic acid, EDDS) chelators as their corresponding Cu^{II}-complexes in the aqueous matrices. An ultra-performance liquid chromatography/quadrupole time-of-flight mass spectrometry was used. Chromatographic separation was performed using a UPLC HILIC amide column. Sample preparation is easy without pre-treatment steps. Limit of detection was 0.004 μmol L⁻¹ (EDTA), 0.007 μmol L⁻¹ (EDTA-OH) and 0.008 μmol L⁻¹ (EDDS). The coefficient of determination (R^2) was 0.999 for the chelators with repeatability of 3%. The developed method was successfully applied to the measurement of chelator concentration in lake water samples.

Keyword: chelating agents or chelators, HILIC amide column, UPLC-Q-TOF-MS, water quality, freshwater

O3-31 CHARACTERISTICS OF PHOSPHORUS SORPTION-DESORPTION BEHAVIOUR AND EFFECTS OF SALINITY, PH AND TEMPERATURE ON PHOSPHORUS SORPTION IN SEDIMENTS OF A LARGEST BRACKISH WATER LAGOON, CHILIKA, SOUTH ASIA - A CASE STUDYSaroja Kumar Barik¹, Prasanta Rath¹, Tapan Kumar Bastia¹, Satya Narayan Bramha², Srikanta Samanta³, Dibakar Behera¹

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The lagoon, Chilika positioned as one of the largest brackish water ecosystems and designed as a Ramsar site in South Asian continent. Phosphorus sorption and desorption process can able to predict the status of phosphorus as the source or sink for coastal lagoon ecosystems. A very few studies on this aspect has been standardized for coastal lagoon in the south Asian continent. The sorption-desorption processes standardize in the laboratory maintaining the same environmental condition of the lagoon, Chilika. The effects of major water quality parameters like salinity, pH and temperature on phosphorus sorption on sediments were studied for the outer channel (OC), northern sector (NS) and southern sector (SS) in the lagoon, Chilika. The lagoon sediment for phosphorus sorption could be better assigned by the modified Langmuir model than by the modified Freundlich model. Effect of salinity, pH, and temperature on phosphorus sorption could be better understood by a binomial equation. The rate of phosphorus sorption increases with increasing salinity, pH, and temperature at low ranges. Whereas it decreases in excess of threshold values. The maximum phosphorus sorption capacity (Q_{max}) was more for NS sediments (258 mg/kg) compared with OC (219 mg/kg) and SS sediments (237 mg/kg) ($p < 0.05$). The percentage of phosphorus desorption (P_{des}) in the NS sediments (8.5-64.5%) was much lower than those in OC (29.7-126.9%) and SS sediments (21-109.5%). This study can able to help wetland manager to control eutrophication status of the lagoon by immediate effect of increasing P sorption through freshwater restoration.

Keyword: Phosphorus, sorption, desorption, isotherm models, brackish water lagoon

O3-32 CHARACTERISTIC OF THE PHOTOCHEMICAL RELEASE OF PHOSPHATE FROM RESUSPENDED SEDIMENTS UNDER SOLAR IRRADIATIONXiaolu Li

Huazhong Agricultural University

In previous studies, resuspended sediments that were exposed to simulated solar irradiation could release dissolved phosphate (PO_4^{3-}). However, the mechanisms of phosphate release remain unclear. In this research, a battery of experiments was performed to reveal the mechanisms of the photochemical release of phosphate from resuspended sediments of a shallow eutrophic lake under solar irradiation. The results show that the PO_4^{3-} released in resuspended sediments was significantly higher than that in the dark control or in water alone after treatment with solar irradiation for 6 h. The results of sequential chemical extractions showed that the concentrations of labile organic, moderately labile organic and residual organic phosphorus decreased in the resuspended sediment after 6 h of solar irradiation; of these, moderately labile organic phosphorus was the greatest contributor to the release of dissolved phosphate in resuspended sediment. Orthophosphate, phosphate monoesters, phosphate diesters and pyrophosphate were detected with ^{31}P -NMR. It is worth mentioning that the diester- P and pyro-P species disappeared after 6 h of irradiation. All of these results suggest that photochemical processes may lead to PO_4^{3-} release from sediment in aquatic environments. Moreover, the content of photochemical release of PO_4^{3-} increased with the increasing of suspension concentration within a certain concentration range and the photochemical release of PO_4^{3-} has significant spectral sensitivity.

Keyword: sediment, phosphorus, resuspension, photochemical, vertical distribution

O3-33 SPATIO-TEMPORAL VARIABILITY OF WATER QUALITY IN A LARGE SHALLOW LAKE IN SOUTHEAST ASIA: TONLE SAP LAKE, CAMBODIA

Sok Ty¹, Ilan Ich¹, Yang Heejun², Chantha Oeurng¹, Layheang Song¹, Sokly Siev^{1,2}, Sovannara Uk^{1,2}, Marith Mong¹, Seingheng Hul¹, Rajendra Khanal², Yoshimura Chihiro²

¹Institute of Technology of Cambodia, ²Tokyo Institute of Technology, Japan

Tonle Sap Lake (TSL) in lower Mekong River Basin and also is the largest freshwater lake in Southeast Asia at the end of the wet season. The water quality and decline in biological resources have been raised regarding the degradation of water quality in Tonle Sap Lake. The study aimed to study variability in water quality in the large shallow lake scale at temporal and spatial scale; and to better understand the state of water quality in this largest Southeast Asia shallow lake. The presented study was based on surface water quality collected from cross-section of Tonle Sap Lake covering a maximum of 37 sampling stations during December 2016 and June 2017 corresponding to receding and rising stage of lake volume, respectively. Variation of water depth was high between December and June (on average 2.7 m in June and 4.7 m in December) and caused high variability for TSS (170 mg/l in June and 7 mg/l in December). However, low variability of rising and receding stage had been detected for DO. Based on information obtained from this study, it provided the information regarding the spatio-temporal water quality in various layers to understand the state of water quality in TSL. Additionally, the integration of process-based information with interpolation maps could support the further study of prior sampling points or monitoring program.

Keyword: Tonle Sap Lake, water quality, spatio-temporal variability

O3-34 STATUS OF BIOLOGICAL WATER QUALITY OF MAIN RIVERS CONNECTED TO TONLE SAP LAKE, CAMBODIA

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Water sources in the Cambodia are being contaminated by the untreated wastewater discharge from the city; however, the biological water quality data is scarce in the region. We investigate the presence of *Escherichia coli* (*E. coli*), coliform and its gene (*uidA*) in Mekong river, Tonle Sap river and Tonle Sap lake since this environmental water was affected by domestic wastewater. Concentration of *E. coli* and coliform in Tonle Sap river were higher than those in Tonle Sap lake and Mekong river. *E. coli* concentration in Tonle Sap river is about 10 times higher than in Tonle Sap lake and about 100 times higher than in Mekong river. The *uidA* gene was identified in Tonle Sap river almost every month from March to December 2017 while *uidA* was identified in Mekong river only from March to May 2017. The results from this study demonstrated that the main water sources in the country such as Tonle Sap lake, Tonle Sap river and Mekong river are under the pressure of fecal contaminated source. The untreated wastewater from the city, which may contain high concentration of virulent microorganisms, was discharged into the water body in daily basis. The construction of wastewater treatment plant in the country is necessary for removal of unwanted substances or microbes for improving the water source quality and for sustainable development.

Keyword: biological water quality, lake, river, wastewater, environmental water

O3-35 SURVIVAL OF *ESCHERICHIA COLI* K12 AND DETECTION OF ANTIBIOTIC-RESISTANT BACTERIA IN TONLE SAP, MEKONG AND BASAC RIVERS

Reasmey Tan¹, Ratana Che¹, Monychotpey Chanto^{1,2}, Sivchheng Phal^{1,2}, Porsry Ung^{1,3}, Sovannary Un¹, Leakhena Chhien¹, Sothearith Thong¹, Chanthol Peng^{1,3}, Kazuhiko Miyanaga³, Yasunori Tanji³

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The freshwater ecosystem has been depleted gradually by human activities along the rivers including the waste disposal, which will contaminate water ecosystem, and uncontrolled widely antibiotic use in aquacultural purpose. Fecal contamination and the presence of antibiotic-resistant bacteria can cause serious problems to people living along the lake and rivers. Therefore, this study aims to investigate the survival of *Escherichia coli* K12 using dialysis membrane and to detect the antibiotic-resistant bacteria (ABR) in Tonle Sap River (TSR), Mekong River (MR) and Basac River (BR). The physiochemical and microbiological characteristics of waters in these 3 sites were analyzed. Moreover, control (*E. coli* K12/PBS) and sample (*E. coli* K12/River water) conditions were placed on the surface of TSR, MR and BR and the survival of *E. coli* K12 was observed for 12 days. In addition, six antibiotics including ampicillin, meropenem, ciprofloxacin, vancomycin, kanamycin and tetracycline were used to detect the antibiotic-resistant bacteria in these 3 sites. As the result, physiochemical characteristics slightly affect the survival of *E. coli* K12 as the turbidity was higher which could block sunlight to get through the waters. Moreover, it was found that *E. coli* K12 could survive only 8 days in TSR and they continued to survive until day 10 and died out in day 12 in MR and BR. The detection of ARB showed that high numbers of bacteria ranging from 3×10^2 to 2.31×10^4 CFU/mL were resistant to all antibiotics used. Among these 3 sites, ARB were detected in high amount in TSR.

Keyword: Tonle Sap River, Mekong River, Basac River, *E. coli* K12, antibiotic-resistant bacteria

O3-36 TEMPORAL DYNAMICS OF WATER QUALITY IN TONLE SAP LAKE IN KAMPONG LOUNG, CAMBODIA, BASED ON HISTORICAL DATAMarith Mong¹, Ty Sok¹, Illan Ich¹, Chantha Oeurng¹, Layheang Song¹, Seingheng Hul¹, Yoshimura Chihiro²¹Institute of Technology of Cambodia, ²Tokyo Institute of Technology

Assessment of seasonal changes in surface water quality is an important aspect for evaluating temporal variations of river pollution due to natural or resulting from inputs of point and non-point sources. In this study, the total of 16 surface water quality parameters was collected from 1995 to 2010 at the Kampong Loung, the Southern part of the largest freshwater source in South East Asia, Tonle Sap Lake by MoWRAM. Hierarchical agglomerative clustering technic was applied to assess classification of the data. The trend analysis was done using the Mann-Kandall and Sen's slop estimator based on cluster and monthly average from 1995 to 2010. The analysis reveals 3 classes were found with the level of $(Dlink/Dmax) \times 100 < 25\%$. The significant trend was detected significance for most parameters except CODMN for the monthly average trend analysis. The positive trend was determined in the first cluster. The test found temperature has significantly increased which lead to increasing concentration Ca, K, and TOTP. The reason of increase TSS due to the movement of floating village and busy boat navigation. The study is crucial for understanding for future sampling as well as supporting a decision on lake management.

Keyword: temporal variation, Spearman, Mann-Kandall, Sen's slope, cluster analysis

O3-37 LONG-TERM TEMPORAL VARIATION IN LAKE INAWASHIRO WATER QUALITY

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Fukushima Prefectural Centre for Environmental Creation

Deterioration of water quality in Lake Inawashiro, based on increased chemical oxygen demand (COD) and detection of coliform bacteria, has accompanied the rapid pH neutralization, which started from the mid-1990s. To elucidate the cause of the deterioration, we investigated long-term temporal variation in water quality data collected continuously by Water and Air Environment Division, Social Affairs and Environment Department, Fukushima Prefectural Government. In particular, we focused on parameters that are highly relevant to internal primary production in the surface water layer at the center of the lake. Our results showed that the surface water of Lake Inawashiro showed a dramatic increase in primary production because the cell density of both phytoplankton and zooplankton increased exponentially since the start of neutralization. Moreover, primary productivity may be accelerated by not only lower biological toxicity and elevated alkalinity due to neutralization, but also by changes in the dynamics of nutrient salts in lake water. To design strategies to improve the deteriorated water quality of Lake Inawashiro, it is necessary to clarify the dynamics of organic matter and nutritious salts and to accurately assess the pollution load from inflowing rivers based on long-term temporal monitoring of water quality parameters in the watershed of Lake Inawashiro.

Keyword: water pollution, nutrient dynamics, primary production

O3-38 WATER QUALITY OF FIVE SELECTED LAKES IN SOUTHERN LUZON, PHILIPPINES

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Centro Escolar University-Manila

The study focuses on important lakes in the Philippines such as Bunot Lake, Taal Lake, Tikub Lake, Bato Lake and Buhi Lake. This paper aimed to describe the physical and chemical parameter analyses of five selected lakes in Southern Luzon, Philippines. Three replicates of water samples were collected (phosphate and TSS); and others were measured on sites from five lakes (January to March 2017). The physical parameter included water temperature, pH and turbidity, whereas the chemical parameters included conductivity, dissolved oxygen (DO), phosphate, ammonia, and total suspended solids (TSS). These five selected lakes revealed that conductivity, turbidity, TSS, phosphate and ammonia content exceeds the DENR Administrative Order (DAO 2016-08) range. The results are significantly different between 0.22 ± 0.00 to 1779.42 ± 59.41 mg/L for conductivity; 8.42 ± 1.00 to 50.23 ± 23.02 NTU for turbidity; 1 ± 0.00 to 96 ± 76.68 mg/L for TSS; 0.07 ± 0.01 to 1.22 ± 0.03 mg/L for phosphate; and lastly, 0.27 ± 0.04 to 1.47 ± 0.35 mg/L for ammonia. Taal Lake has the largest variation of conductivity, phosphate and ammonia. Bato Lake has the largest variation of turbidity and TSS. Bunot Lake has the largest variation of phosphate and ammonia because of anthropogenic activities. The extremely high content of TSS and turbidity has caused poor and stressful conditions for the aquatic life of lakes. Proper management, planning and monitoring is required to prevent further damage of the lake ecosystem from different anthropogenic activities.

Keyword: Physical Parameters, Chemical Parameters, Water Quality, Lakes

O3-39 GENOMIC ANALYSIS OF TWO ODORIFEROUS *STREPTOMYCES* SP. ISOLATED FROM TROPICAL FRESHWATER OF SOUTHEAST ASIA PROVIDE AN INSIGHT INTO THE IDENTIFICATION OF POTENTIAL TEMPERATURE SENSOR

Nurul Syahirah Shamsol Anuar¹, Motoo Utsumi¹, Hirofumi Hara², Norio Sugiura¹

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Musty odor compounds released have mostly been studied during the warmer season and well documented. Previous study successfully isolated two odoriferous *Streptomyces* sp. (S1 and S5) from tropical freshwater of Southeast Asia. Both isolates showed distinct characteristics against temperature difference (20° C and 30° C). S1 showed clear induction of geosmin at 30° C and none at 20° C contradict with S5 which produced higher amount of geosmin at 20° C compared to 30° C. In case of temperate isolate, they have thermosensing device to adapt temperature changes. However, S5 does not work to sense the temperature as it shows less sensitivity than S1 which lead to our hypothesis that S5 does not have the sensor for temperature stress. These isolate were then sequenced using Illumina HiSeq4000 and draft genome sequence yielded 7.79 Mb and 7.20 Mb genome size of S1 and S5, respectively. Since the genome size of S5 is smaller compared to S1, there might be some regulatory proteins which not available in the genome of S5 is/are available in S1 may be the possible temperature sensor. Here, we provide draft genome sequence analysis of both isolates which is very important for discovery more about this temperature sensor and to understand how the mechanisms involve in these isolate.

Keyword: Streptomyces, Temperature Sensor, Genome Sequence, Biosynthesis, Musty Odor

O3-40 EUTROPHICATION MAPPING OF LOWLAND LAKES IN NEPAL

Prava Pandey

National Lake Conservation Development Committee/Ministry of Culture, Tourism and Civil Aviation

Eutrophication is a major water quality problem in the lakes of lowland of Nepal, causing turbid water with high algal biomass and offering poor condition loadings of limiting nutrients, such as nitrogen and phosphorus (i.e., cultural eutrophication), to the aquatic ecosystem with dramatic consequences for drinking water sources, fisheries and recreational water bodies. To mitigate these problem this study was conducted to assess the status of eutrophication of Betana Lakes, Rajarani Lakes and Tal Taliya Lakes of Eastern Nepal through remote sensing techniques and comparing the eutrophication indices derived from field data with remote sensed data. For each lake, two sites were sampled and two samples were collected for the measurement of Chlorophyll-a (Chl-a), Phaeophytin, Nitrate, Phosphate, and Ammonia. Chl-a concentration was found to be in the range of 9.6 -38.7 in Betana Lakes, 1.5-38.28 in Raja Rani and 8.9-39.0 in Tal Taliya of lowland Nepal. The remote sensing based Chl-a prediction model was applied where the Landsat visible bands ranging from blue (OLI 2) to green (OLI 4) and near-infrared band (NIR) (OLI 5) were used and applied to obtain the relationship between the sub-surface reflectance and the bio-physical parameters. Highest correlation ($R^2 = 0.9176$) was found between in-situ Chl-a concentration and band ratio of the reflectance of Landsat 8 OLI band (B5/B4). Therefore, this band ratio (B5/B4) was considered as the best predictor of Chl-a concentration and further used for developing the prediction model for the eutrophication mapping of the lakes.

Keyword: water quality, Chl-a, eutrophication

O3-41 LAKES OF THE CHERNOBYL EXCLUSION ZONE: THE EFFECTS OF LONG-TERM RADIATION EXPOSURE ON AQUATIC BIOTA

Dmitri Gudkov¹, Natalia Shevtsova¹, Natalia Pomortseva¹, Elena Dzyubenko², Valentin Shukalevich¹, Segrey Kireev³, Andrian Yavnyuk⁴, Alexander Kaglyan¹

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The effects of chronic irradiation of aquatic biota in lake ecosystems within the Chernobyl exclusion zone during 1998-2017 were studied. It is determined that the rate of chromosomal aberrations in the root meristem tissues of aquatic plants in the most radioactive contaminated lakes on average in 2-3 times, and in cells of the pond snail embryos in 4-6 times exceeding the spontaneous mutagenesis level, inherent to aquatic organisms. Analysis of leukograms of fish peripheral blood showed the decrease of lymphocyte cells, as well as the increase in the number of granulocytic cells (neutrophils and pseudoeosinophils) with increase of radiation dose rate. Along with changes in leukograms an increased level of morphological damages of erythrocytes (structural and proliferation abnormalities) was determined, which is generally for prey fish in 4-12 times and for predatory fish in 7-15 times higher than in fish from reference lakes. Some morphological changes in gills and axial skeleton of fish were determined as well. Analysis of the viability of the seed progeny of the common reed from contaminated lakes at germination in the laboratory showed a reduction in technical germination, germination energy and seed viability with increase of radiation dose rate. At the same time significantly increased the number of abnormalities of seed seedlings in view of necrosis of roots, disturbance of gravitropism, damages of organogenesis and disorder of chlorophyll synthesis were discovered.

Keyword: Chernobyl exclusion zone, lake ecosystems, radioactive contamination, radiation effects, hydrobionts

O3-42 ABUNDANCE OF CILIATED PROTOZOANS IN A TROPICAL LAKE: THE CASE OF LAKE LANAOS, PHILIPPINES

Camar Pauti Ameril

Mindanao State University-Marawi City

Lake Lanao in the Southern Philippines is the second largest lake in the country and considered to be one of the ancient lakes of the world. It is best known for its endemic cyprinid fishes but there is a scarce of information regarding its trophic status with the use of biological indicators particularly ciliated protozoans. This study was conducted to determine the abundance of ciliated protozoans in Lake Lanao across its littoral and pelagic zones. Their usefulness as indicators of trophic status of Lake Lanao was evaluated. Five sampling sites were selected from four municipalities namely: Ditsaan-Ramain and Marawi City, Binidayan, Balindong and Taraka as representatives for north, south, west and east regions of the lake, respectively. Water samples were collected in three replicates with the use of conical plankton net with a mesh size of 53 microns. The total mean abundance of ciliated protozoans in Lake Lanao was 1,071.70 and 1,686.21 (indiv./m³) for the littoral and pelagic zones respectively. However, there was no significant difference between the mean abundance of ciliates in the littoral and pelagic zones using t-test for the Equality of Means at alpha level of 0.05. Both the ciliate mean abundance and the Trophic State Index (TSI) based on Secchi disk transparency supported an oligotrophic classification of Lake Lanao. Among the measured physico-chemical parameters, only temperature was positively correlated to the mean abundance of ciliates whilst conductivity, pH and dissolved oxygen were negatively correlated to the ciliates' mean abundance.

Keyword: tropical lake, trophic status, ciliated protozoans, abundance, Ancient lake

Technical Session 4: Lakeside History and Culture Invited Lecture

TS4-1 Teshi-O-PET IN HOKKAIDO IS A SANCTUARY FOR CANOES**Takaharu Kusano**

Teshi-o-pet Non-Political Organization

Hokkaido Heritage “Teshio river” (total length 256km) is unusual in the first class river because it flows toward the north. This river boasts the longest 157km (about 100miles) in Japan, where there are no artificial structures and the canoe can long touring to the estuary.

In the Teshio River there was a life of Ainu people who once lives by hunting salmon and trout. Hokkaido has celebrated its 200th anniversary this year. Their godfather is Takeshiro Matsuura(1818 ~ 1888). He was an explorer who was active in the Meiji Restoration since the end of the Tokugawa period, and traced back to the Teshio River in the dugout canoe and investigated the basin.

After that, the Pioneers asked for abundant resources, they went up to the Teshio River and parted in undeveloped land. By that, villages and towns were born.

Here, we will introduce the activities of the organization that continues to convey the charm of Teshio River through a canoe event that can admire such undeveloped land. In the year 2018 named the 150th anniversary of Hokkaido, the 27th event was held as the first international convention. Rowing down through the basin municipality from upstream to downstream will deepen watershed cooperation. Currently, it is established as the largest canoeing event in Hokkaido. Over 5,000 people have participated so far and contribute greatly to regional vitalization.

Keyword: Use of riparian areas, culture, tourism, community development

Curriculum Vitae

April 1980: Joined Bifuka Town
 April 1996: Assistant Manager for taxation, Division of Tax Affairs
 April 1998: Assistant Manager for Planning and for Publicity Statistics, Division of Planning Promotion
 July 2004: Senior Official for Administrative Reform, Division of General Affairs
 June 2007: Senior Official for Agricultural Group, Division of Industrial Facilities
 April 2014: Senior Official for Planning Group, Division of General Affairs
 June 2015: Doubled as Agricultural Affairs Manager and Agricultural Committee Secretary-General
 April 2018: Manager, Division of General Affairs

TS4-2 THE SUSTAINABILITY OF RELATIONSHIPS BETWEEN THE LAKE REGIONS AND TOURISM



Katsumi Yasumura

Otemon Gakuin University

This study discusses the possibility of “tourism-based community development” (TBCD) in materializing the sustainability of the lake regions and the inland waters around them. Tourism in many of the lake regions has been criticized until now because of various negative influences caused by its development and management. However, sustainable tourism (ST) initiated since the 1990s such as ecotourism and cultural tourism was evaluated as the only successful case of sustainable development by the World Summit on Sustainable Development (Johannesburg Summit) in 2002. Such ST can be found in the TBCD of Japan. Successful cases of TBCD have acquired a good overall reputation in Japan since the late 1990s. TBCD is characterized as the regional promotion of sustainable community by community residents. A community is constructed through ST on the basis of a dynamic balance among the four component factors of its social structure, namely 1) the economy, 2) social capital, 3) culture, and 4) the human ecosystem. ST functions in the process of TBCD as follows: 1) ST development yields “economic profits,” 2) strengthens “social capital” as residents collaborate with each other in the process, 3) protects the indigenous “culture” as a tourist attraction, and 4) conserves “nature” and the “human ecosystem” in the community. Issues in introducing TBCD into lake regions are examined based on cases of TBCD around Lake Biwa, Shiga. Consequently, this study concludes that the two factors of traditional culture and educational tourism related to the water environment have critical importance in the TBCD of the lake regions.

Curriculum Vitae

Professor, Faculty of Regional Development Studies, Otemon Gakuin University since April 2014 after working as Research Associate, College of Sociology, Rikkyo University; Associate Professor, School of Business Administration, Sanno College; Professor, Faculty of Commerce, Hokkai Gakuen University of Kitami; Professor, Faculty of International Studies, Suzuka International University; and Professor, Faculty of Regional Promotion, Nara Prefectural University

Technical Session 4: Lakeside History and Culture Section 1: Activities and Conservation of Riparian Areas

O4-1 PROMOTING BICYCLE TOURISM BASED AROUND LAKES ~THE SHIGA PREFECTURAL GOVERNMENT'S EFFORTS AROUND BIWAICHI AND THE COOPERATION BETWEEN LAKES KASUMIGAURA, BIWA AND HAMANA~

Seiji Tsuda

Shiga Prefecture

In Shiga, BIWAICHI, the bicycle ride around Lake Biwa, is gaining momentum amongst cycling enthusiasts, and more and more people are experiencing it every year. The Prefecture, continuing its efforts with local cities and towns, business owners and other related organizations, is building its comprehensive promotion plan to make the most of BIWAICHI to not only promote every area of the prefecture, but also raise awareness of environmental protection and improve residents' health, etc.

At the same time, we are collaborating with Lake Kasumigaura (Ibaraki) and Lake Hamana (Hamamatsu, Shizuoka), who are also working on promoting their areas through lake-based bicycle touring, to build up even more excitement for our projects.

Therefore, we would like to present our project, including concrete efforts, as an example of Lakeside History and Culture at the World Lake Conference.

Keyword: riparian areas, tourism

O4-2 EFFORTS AIMED AT THE REGISTRATION OF THE RAMSAR CONVENTION IN TAM GIANG LAGOON, CENTRAL VIETNAM

Yukihiro Hirai

Department of Geography, Komazawa University

In the central coast of Vietnam, many lakes, including five lagoons with an area of 10 km² or more, are distributed, where are overwintering places of internationally important migratory birds. Among them, the Tam Giang Lagoon has been recognized as one of the important wetlands in Vietnam since the 1990s and has become a prospective candidate for the Ramsar Convention. In this report, we reviewed the past efforts aimed at registering the treaty in the Tam Giang Lagoon and examined current and future issues. As a result, it is urgent to set nature reserves as the core of biodiversity and ecosystem conservation. At that time, not only restoration of reed community in the core zone but also preservation of the brackish water environment is important. However, setting of nature reserves and restoration of brackish water environment will also restrict the livelihood of the local people, so it is necessary to create new job opportunities that are guaranteed and alternative. As a clue, it is possible to develop ecotourism focusing on rich and diverse ecosystems and foster regional brands that make use of the Ramsar Convention.

Keyword: Ramsar Convention, nature reserves, resource management, ecotourism, wise use

O4-3 ENVIRONMENTAL CHANGES AND HUMAN ACTIVITIES DURING JOMON PERIOD AROUND LAKE KASUMIGAURA

Tsubasa Kamei^{1,2}

¹Tsuchiura archaeology museum, ²Mt. Tsukuba Area Geopark Promotion council

In this paper, interactions between Jomon prehistoric hunter-gatherers and environmental changes of lake Kasumigaura are considered.

Lake Kasumigaura is formed as inner bay by Jomon transgression in early Holocene. Around lake Kasumigaura, shell middens occurred in late stage of initial Jomon (ca.8,500~7,000 cal yr BP). Gathered shells mainly consist of *Crassostrea gigas* and *Tegillarca granosa*. After early Jomon, shell middens are mainly composed of *Meretrix lusoria*. These changes of gathered shell species seem to reflect bottom sediments of tidal flat. Sea level reached the highest (+2 ~ 3m) in the early stage of early Jomon (6,500~6,400 cal yr BP). Valleys drowned by transgression had become alluvial marsh with regression. These valley floors are used as the work area for woodwork, lacquer work and food preparation by Jomon people. In late to final Jomon, pottery salt production began. Jomon salt production suggest that lake Kasumigaura still had been inner bay even regression ongoing. Jomon shell middens are witness of interaction between lake Kasumigaura and Jomon people. We have to conserve and utilize these archaeological sites.

Keyword: culture, Jomon period, transgression, shell midden, geopark

O4-4 NEVER-ENDING PROVINCE WHERE KASUMIGAURA SUPPORTS SYMBIOSIS BETWEEN PEOPLE AND THE RICH NATURAL ENVIRONMENT

Takashi Chiba

kasumigaura city museum of history curator

Japanese cultural anthropologist SASAKI Kōmei (1929-2013) distinguished "evergreen forest culture" that characterized western Japan and "beech forest culture" that characterized eastern Japan. Regions surrounding the Lake Kasumigaura may be considered as an "ecotone" between evergreen forests and deciduous forests characterized by beech. Indeed, the natural environment of the Lake Kasumigaura region is very rich, from which local people have been benefitted greatly. Historically, the Lake Kasumigaura region was situated in the southern part of the Old Province of Hitachi, and the *Gazetteers of Hitachi* compiled in the eighth century A.D. described the Hitachi region as a "never-ending province" that was ideal for people's living. Before and after the eighth century, a kind of "symbiosis" between people and the rich natural environment existed in this region; human culture in this region always flourished owing to the rich natural environment. From a historical perspective, this symbiosis depended upon people's standing in awe of and gratitude toward nature. Such attitude toward nature has always kept people from the destruction and overuse of nature, which maintained good symbiotic relationship between them. In this presentation, I call for the necessity of maintaining this attitude today, especially in view of contemporary people's lack of consciousness toward nature.

Keyword: Abundant natural favor, Awe to nature and thanks, History on a symbiosis relation between the mankind and nature

O4-5 WATER FRONT INTERCHANGE "THE CITIZENS' FESTIVAL FOR SWIMMABLE LAKE KASUMIGAURA"

Kazuo Ichimura, Tetsuo Awano, Noboru Hakata, Kouichi Ookawa

Kasumigaura Citizens' Association

"The Citizens' Association for the World Lake Conference" was started with the slogan "Person/Town Moves, and Water Moves" in September 1993. Then the 6th World Lake Conference was held at the Lake Kasumigaura in October 1995 with the 4 group partnership of citizens, administrations, researchers, and industries. This conference leads to hold the event "the Kasumigaura Citizens' Evening", that is, the existing "Citizens' Festival for Swimmable Lake Kasumigaura". This festival parts in the land area and the water area and is frequented by the attendance more than 6,000 every year. We would like many local residents and industries to come to the Lake Kasumigaura and to touch it. The deep understanding about today's current state and approach to water purification would make people interest in nature. The objective of this festival is to bring up the people who can take action by oneself for the community including Kasumigaura area through having further friendship in the Lake Kasumigaura which is local treasure, and is also our important water resources. We aim at realization of "Swimmable Lake Kasumigaura", and push forward community improvement as the place of recreation and relaxation for people.

Keyword: riparian area, recreation, community development, get·close·to·water activities, culture

Technical Session 4: Lakeside History and Culture Section 2: The History and Citizens' Activities Around Kasumigaura

**O4-6 LET'S RIDE IN CYCLING PARADISE "IBARAKI!"
- "TSUKUBA KASUMIGAURA RING RING ROAD" CYCLING EVENTS PRACTICE REPORT -**

Koichi Harigae, Yukari Furukawa

HMB Outdoor Club, JAPAN Lake Kasumigaura Cycling Team

HMB Outdoor Club, with the theme of "Let's Ride in Cycling Paradise IBARAKI", has been providing and practicing cycling events taking full advantage of the characteristics of Lake KASUMIGAURA since 2004.

Over the years, we have brought more than 1400 riders to IBARAKI from not only IBARAKI prefecture but KANTO / TOHOKU and other areas.

This is a record tracing back from its initial phases as ideas turned to practice, and a statement of future goals.

Keyword: Characteristics of Lake Kasumigaura and Utilization for Cycling

O4-7 DIVERSIFICATION OF USES AND ADJUSTMENT PROBLEMS OF INLAND WATER: A CASE STUDY OF UPPER YOSHINO RIVER

Sachiko Harada¹, Xiobo Lou²

¹Mie University, ²Tokyo University of Marine Science and Technology

The purpose of this research is to clarify the characteristics and issues of the adjustment rules in using inland water for leisure. We focused on the case of the Yoshino River basin, where rafting is the most active in Japan. In this area, an agreement between rafting shops and local fishery cooperatives has been made, which aims smooth river utilization. Regarding the problems of utilization adjustment of the inland water, the problem of "fishery versus leisure" has been discussed in early studies. On the other hand, in the case which the present study observed, the rules are constructed in "leisure (fishing) and leisure (rafting)", which successfully arranges various uses of rivers. However, concerning the content of the rules, some problems remain in safety and fairness.

Keyword: inland water, fishery, leisure, adjustment rules

O4-8 A STUDY OF THE WATER PASSING CAPACITY IN TAMAGAWA JOSUI BY FIELD OBSERVATION AND HYDRAULIC ANALYSIS

Mayuko Shinzawa¹, Mai Yamada², Daiki Kakinuma¹, Tadashi Yamada³

¹Graduate School of Science and Engineering, Chuo University, Tokyo, ²Kanto Regional Development Bureau, Ministry of Land, ³Faculty of Science and Engineering, Chuo University, Tokyo

Tokyo Olympics will be held in 2020. However, the lack of waterfront and degradation of the aquatic environment in closed water body are becoming problems in Tokyo. As one of countermeasures for these problems, there is water flow to "Tamagawa Jyosui" which was the artificial channel created by the Shogun Ieyasu Tokugawa in 1653. The total length is 43km, and the difference in elevation is only 100m. When the peak period of using Tamagawa Josui, it is said that Tamagawa Josui expanded the city of Edo into the world's largest city with a population of one million because of there has 33 diversion aqueducts, and it supported a wide range of economy, industry, agricultural and transportation. But now, 8 diversion aqueducts because the modern aqueduct was proceeding due to epidemic cholera in 1886. In addition, river water flows only in the upper reach, while sewage-treated water flows in the middle reach. Because it is a blind ditch which is unknown whether water is flowing downstream. Under these circumstances, activities have been conducted by industry, government, academia, and the people to revive Tamagawa Josui in recent years. The purpose of this study is to grasp the current flow regime of Tamagawa Josui's main stream and diversion aqueducts. For that purpose, we found that the current flow situation performed a field observation and hydraulic accounting based on that, and clarified the current flow regime of Tamagawa Josui.

Keyword: waterfront, culture

Technical Session 4: Lakeside History and Culture Section 4: Water System and Life Culture in Asia**O4-9 DHANMONDI LAKE: A CULTURAL ASSIMILATION OF THE CITY DWELLERS**Md Golam Rabbi

Nature Conservation Society

Dhaka, the capital of Bangladesh was known by its heritage, culture, canals & lakes which were connected to the three main rivers that encircled it. In the frenzy of urbanization, Dhaka has seen a drastic reduction of its lakes and canals resulting in the brutal transformation of urban tissue. Dwindling water bodies has an adverse impact on the urban environment of Dhaka but this lakes and canals have also cultural values to the city dwellers. Dhanmondi lake is located in the center of the city (23° 43'N and 90° 26'E). It is 3 km in length, 35-100m in width, with a maximum depth of 4.77m and the total area of the water body is 37.37 ha. There is one box culvert to pass the heavy rainfall. The lake is under the management of several authorities looking after its various aspects: City Corporation, Fisheries and Environment Department etc. The Lake has now become a popular tourist attraction, with cultural hubs, lush green vegetation, islands, lakeside walkway and benches for visitors to sit and relax on. The open-air amphitheater, Rabindra-Sarobar, is also located on its banks, mostly recognized venue for concerts, dramas, theater performances and a variety of cultural programs, festivals and holiday celebrations. During festivals such as Independence Day, Eid and Pohela Baishakh (Bengali New Year) it becomes a harbor of joys and color. The founding father of Bangladesh, Bangabandhu Sheikh Mujibur Rahman had chosen his residence at the bank of this lake. The lake is the lifeline to citizen of the capital.

Keyword: Dhanmondi, Dhaka, Baishakh, Rabindra-Sarobar, cultural hub

O4-10 IMPACT OF CLIMATE CHANGE ON THE FOLK CULTURE OF HAOR BASIN IN BANGLADESHTapas Ranjan Chakraborty

Jahangirnagar University

Bangladesh is a land of wetlands. The folk culture of the country is mostly associated with the wetlands. Haor basin is a special type of back swamp with many lakes found in northeastern part of Bangladesh and adjacent India. Haor is the second most vulnerable ecosystem in Bangladesh. There is a significant change in the season due to climate change in that lake areas. The changes in the seasons has interfered the folk festivals as those events are following the calendar dates. Many lake festivals are under risk of extinction. There is huge deviation on the local sayings which was the major part of the culture. Traditional knowledge is found not in function due to erratic rainfall and unpredictable weather. According to the community documentation and support to practice can help the community protect and conserve the cultural values. Community based planning and community lead implementation have the capacity of incorporating cultural values in development action. The initiative to support the conserve the cultural heritages can be care as climate action. The study has been conducted in the Medir Haor, a lake in the Haor basin of Bangladesh. Following the participatory research tools the study was conducted in January and February 2018

Keyword: Lake, Folk Culture, Climate Change, Documentation, Traditional Knowledge

O4-11 MANAGEMENT OF MANGROVE FRINGED KOGGALA LAGOON FOR SUSTAINABLE LIVELIHOOD DEVELOPMENT - CASE STUDY IN SRI LANKAIndika Rohan Palihakkara, Abeykoon Jayasundara Mudiyanse, Chathura Madushanka Siriwardana

Department of Crop Science, Faculty of Agriculture, University of Ruhuna

The livelihood framework identifies five core capitals which sometimes are called livelihood building blocks. These are natural, social, human, physical and financial capital. On the other hand, rapid deforestation and biodiversity losses are depriving people of valuable mangrove based water resources, such as fuel wood, fish, shrimp, food, medicine, and ecosystem based services such as bird watching, boat riding. Koggala lagoon is located on the southern coast of Sri Lanka. It consist 14 islets with forest, mangroves and terrestrial shrubs. Livelihood around the lagoon mainly depended on tourism and fisheries. Fishing mostly depends on brackish waters due to sea water intrusion into the lagoon. Respondents mentioned there are number of societies, local government involve managing tourist industry as well as environment. They have been restricted harvesting of mangrove for timber and fuel wood. The landing of sea planes in the lagoon is known to affect the bird populations, and cause erosion of the lagoon banks due to the large waves created during landings. Respondents claims that decreasing of biodiversity in lagoon directly affected on their livelihood due to large scale clearing of mangroves for construction purposes. It was identified operate boats by unskilled people without using safety jackets. Government involvement is necessary to prepare policies to regulate tourist industry and improve infrastructure facilities. Regulate unauthorized construction beside the lagoon and control discharge effluent from nearby free trade zone to improve lagoon biodiversity.

Keyword: Biodiversity, Fishing, Koggala lagoon, Livelihood, Tourism

O4-12 THE SUSTAINABLE APPROACH TO CONSERVE THE RELIGIOUS WATER BODIES IN WESTERN PART OF INDIA

Nagesh Shankarrao Tekale¹, Rajesh Pandit², Santosh Jagdhane³

¹Navdrushti, Mumbai, ²Namami Goda foundation, Nasik, MS India, ³Dorf Ketel, Mumbai, India

India having ancient history of Buddhism and Hinduism was a harbor of numerous water bodies in the premises of temples where water used to be treated as holy and was protected by devotees under public participation. Today, the scenario is tragic one. These places are flourishing but water bodies in their premises are depleting. The pressure on ground water, cutting of large age old trees adjacent to water bodies and increasing load of devotees can be the possible causal factor. These water bodies are the true aquifers which were charged from ground water.

The author conducted the survey of 92 such aquifers located in the premises of Bramhagiri mountain located 28 KM from the mega industrial city Nashik in Western part of India. This mountain is also an origin of Holy river Godavari which is one of the longest in South India hence called South Ganges. Our survey shows that majority of these aquifers though completely dry but still holds religious status where thousands of devotees annually visit them for water worship. Our in depth analysis of each aquifer indicates that these can be revived back to their original fresh water form. If rejuvenated and conserved back then river Godavari can get best strength of water from her origin itself. If water bodies are saved, river can also be saved is a positive message from this lake conservation episode. This research paper highlights the efforts taken by NGO using public participation as a weapon for sustainable approach to save the water bodies.

Keyword: Bramhagiri mountain, Godavari river, Ancient history, Devotee

Technical Session 5: Regional Activities and Matter Cycles Invited Lecture**TS5-1 TRACING NUTRIENT SOURCES CONTRIBUTING TO HARMFUL ALGAL BLOOMS AND OTHER ECOLOGICAL PROBLEMS IN AQUATIC SYSTEMS USING A MULTI-ISOTOPE APPROACH**Carol Kendall

U. S. Geological Survey

Excess nutrients from anthropogenic sources to lakes and other water bodies can cause significant problems for ecosystem health and for the usefulness of the water body for drinking water, recreation, and other purposes. Solutions for these environmental problems are difficult to determine because there are usually many different land-uses that contribute nutrients and organic matter to the ecosystem. In recent years, numerous studies have shown that stable isotopic techniques - particularly multi-isotope approaches piggybacked onto routine monitoring programs -- are a powerful tool for determining sources of nutrients contributing to ecological problems because different kinds of nutrients and kinds of dissolved and particulate organic matter derived from different sources and land uses often have distinctively different isotopic compositions.

The basis for using isotopes to determine the sources of nutrients and other solutes to algae and bacteria is that autotrophic organisms preferentially assimilate the lower-mass isotopes of dissolved solutes. Hence, a comparison of the isotopic compositions of the organisms and the solutes from different sources allows estimation of the relative contributions of different specific nutrient and solute sources to the organisms. And since different nutrient and other solute sources frequently have distinctive compositions, the relative contributions from these different sources can often be reliably determined. This presentation will present an overview of the "state of the science" regarding the ability of isotopes to distinguish point and non-point anthropogenic impacts at various spatial scales, provide suggestions for successful pilot studies, and outline guidelines for future monitoring programs in biologically active and human-impacted systems.

Keyword: nutrients, isotopes, harmful algal blooms, water pollution, ecosystem health

Curriculum Vitae**Academic qualifications:**

1985 – 1993: PhD (Geochemistry), Geology Department, University of Maryland, USA

1973 – 1976: MS (Geology), Geology Department, University of California, Riverside, USA

1969 – 1973: BS (Geology), Geology Department, University of California, Riverside, USA

Professional positions:

2017 – present: USGS emeritus scientist

1990 – 2017: Research Hydrologist (Isotope Hydro-biogeochemist) and Chief of the Isotope Tracers Project, USGS, Menlo Park, California, USA

1980 – 1990: Research Hydrologist, USGS, Reston, Virginia, USA

1976 – 1979: Geochemist at the Department of Geology, Caltech, Pasadena, California, USA

1973 – 1976: Staff research associate at the University of California, Riverside, California, USA

Research summary:

The main thrust of Carol Kendall's research has been the development of a portfolio of multi-isotope and other approaches for investigating water, nutrient, and organic matter sources and biogeochemical processes in large river basins, mostly as part of regional to national-scale water quality and ecological monitoring programs. In so doing, she has worked in watersheds all over the USA, at scales ranging from small pristine catchments in the Rockies and Appalachians, to large wetlands like the Everglades, and to large human-impacted basins like the Mississippi. The main focus of her recent research is using a multi-isotope approach to investigate the effects of flow and nutrients on various ecosystem problems (including hypoxia, food web collapse, and harmful algal blooms) in the San Joaquin and Sacramento Rivers, their delta, and the San Francisco Bay. Common aspects of most of her studies are: (1) that she usually piggybacks them on large-scale state and federal environmental monitoring programs (water quality, ecological, and atmospheric); and (2) that she uses a multi-isotope, multi-tracer approach for the various ecosystems studies, resulting in the development of many regional to continental-scale isoscapes.

TS5-2 FROM LEAVES TO LAKES: REVEALING THE NITROGEN DYNAMICS USING STABLE ISOTOPE TECHNIQUES



Nobuhito Ohte

Biosphere Informatics Laboratory, Department of Social Informatics, Graduate School of Informatics, Kyoto University

The measurement of nitrogen (N) and oxygen (O) isotope values of dissolved nitrate (NO_3^-) has been performed since 1980s. Isotope information of various origins of NO_3^- has been compiled for many different ecosystems. In the beginning of 2000s, the development of the microbial denitrifier method for this measurement has made its throughput higher dramatically. As this method requires a tiny amount of sample volume, it allows us to execute spatiotemporally high resolution and simultaneous measurements of N and O isotopes of NO_3^- . Using this technique, we have been able to reveal the details of transformation and movement of NO_3^- and related N compounds in various ecosystems. We have applied this method to describe the transformation of N in the surface of plants, litter layers, soils and groundwater zones, and also used for identifying the origins of NO_3^- in river basins. In this presentation, I would like to show how we have approached to the N dynamics in various scales of ecosystems using this isotope technique. Then, I would like to discuss the future directions of this study area and associate methodologies applicable to reveal the new insights of N dynamics in terrestrial ecosystems. For example, microbial ecological investigations may provide substantial information to evidence the N dynamics showed as the isotope signatures.

Curriculum Vitae

January 1991:	Associate Professor, Department of Forestry, Faculty of Agriculture, Kyoto University
January 1993:	to January 1994 Visiting Scholar, Dept. Hydrology & Water Resources, University of Arizona
April 1995:	Lecturer, Graduate School of Agriculture, Kyoto University
April 1997:	Associate Professor, Graduate School of Agriculture, Kyoto University
February to October 2003:	Visiting Scientist, Dept. Water Resources, United States Geological Survey
April 2007:	Associate Professor, Graduate School of Agricultural and Life Sciences, the University of Tokyo
November 2014:	Professor, Graduate School of Informatics, Kyoto University
October 2017:	Member, Science Council of Japan

Technical Session 5: Regional Activities and Matter Cycles Section 1: Stable Isotope Ratio**O5-1 IDENTIFICATION OF NITRATE SOURCES IN GROUNDWATERS OF SILANG-STA. ROSA SUBWATERSHED: TOWARDS THE WATERSHED GOVERNANCE**

Osbert Leo Alcantara Privaldos^{1,2}, Ken'ichi Osaka³, Yoshitoshi Uehara⁴, Satoshi Asano⁵, Lei Fujiyoshi⁴, Chikage Yoshimizu⁴, Ichiro Tayasu⁴, Adelina C. Santos-Borja¹, Maria Pythias B. Espino², Noboru Okuda⁴

¹Laguna Lake Development Authority, National Ecology Center, ²Institute of Chemistry, University of the Philippines, ³The University of Shiga Prefecture, ⁴Research Institute for Humanity and Nature, ⁵Lake Biwa Environmental Research Institute

Water quality degradation caused by contamination of nitrate from various sources has become a worldwide environmental problem. Stable isotopes of nitrate-nitrogen ($\delta^{15}\text{N}$) and oxygen ($\delta^{18}\text{O}$) have been used to trace nitrate sources in the hydrosphere. In Silang-Sta. Rosa subwatershed of Laguna de Bay, the Philippines, in which sewage systems have not yet developed well, groundwater nitrate pollution is a matter of great concern to the society. Here, we conducted nitrate $\delta^{15}\text{N}$ - $\delta^{18}\text{O}$ stable isotope analysis with a denitrifier method to identify the source of nitrate pollution in the groundwaters during the dry and wet seasons. Biplots of the nitrate $\delta^{15}\text{N}$ - $\delta^{18}\text{O}$ values suggest that the groundwater nitrate isotope signatures in a hot spot of nitrate pollution are imprinted by those of fertilizers as well as manure/septic wastes. Principal component analysis for groundwater trace element also reveals that groundwaters in the polluted area are derived from the upstream cropland. These results suggest that chemical fertilizers can be one of the major sources of groundwater nitrate pollution in this watershed. The use of this isotope technique aids for the practice of watershed governance, in which variety of stakeholders are involved in mitigation of the nitrate pollution through the integration of local and scientific knowledge.

Keyword: groundwater, nitrogen pollution, nitrate stable isotopes, denitrifier method, Silang-Sta. Rosa subwatershed

O5-2 IDENTIFYING SOURCES OF GROUNDWATER NITRATE USING $\delta^{15}\text{N}_{\text{NO}_3}$ AND $\delta^{18}\text{O}_{\text{NO}_3}$ VALUES IN HOKOTA RIVER WATERSHED, IBARAKI, JAPAN

Saeko Yada¹, Yasuhiro Nakajima^{1,2}, Kenji Matsumori³, Sunao Itahashi^{1,4}, Nanae Hirano¹, Takao Oouchi^{5,6}, Seiko Yoshikawa¹, Sadao Eguchi¹

¹Institute for Agro-Environmental Sciences, NARO, ²Advanced Analysis Center, NARO, ³Western Region Agricultural Research Center, NARO, ⁴Agriculture, Forestry and Fisheries Research Council, MAFF, ⁵Ibaraki Kasumigaura Environmental Science Center, Japan, ⁶Environmental Management Division, Department of Residential and Environmental Affairs, Ibaraki Prefectural Government, Japan

Hokota River watershed (53 km²) has a large impact on nitrogen (N) distribution of the Lake Kasumigaura. The mean of nitrate (NO_3^-) concentration was $9.4 \pm 4.2 \text{ mg N L}^{-1}$ in water samples collected from wells ($n = 60$), and 42% of the whole samples exceeded the environmental water-quality standard (10 mg N L^{-1}). The values of stable isotopes of NO_3^- ($\delta^{15}\text{N}_{\text{NO}_3}$ and $\delta^{18}\text{O}_{\text{NO}_3}$); $7.9 \pm 1.9\%$ for $\delta^{15}\text{N}_{\text{NO}_3}$ and $1.2 \pm 1.2\%$ for $\delta^{18}\text{O}_{\text{NO}_3}$ indicates that major N sources are chemical fertilizer and animal manure. Similar patterns of $\delta^{15}\text{N}_{\text{NO}_3}$ – $\delta^{18}\text{O}_{\text{NO}_3}$ diagram of Hokota River watershed which consists of 3 sub-watershed, suggested that chemical fertilizer and animal manure application ratio is almost the same in the watershed. The slope of $\delta^{18}\text{O}_{\text{NO}_3}$ – $\delta^{15}\text{N}_{\text{NO}_3}$ plot is 0.42, which indicates the significance of microbial denitrification. In conclusion, reduction of both chemical fertilizer and manure applications is required for groundwater quality conservation from NO_3^- contamination.

Keyword: greenhouse cultivation, denitrification, nitrogen and phosphorus cycle, hog manure

O5-3 REGIONAL MONITORING NETWORK IN ATMOSPHERIC AMMONIA CONCENTRATION IN KASUMIGAURA-BASIN IN IBARAKI, JAPAN

Genki Katata¹, Tomohiro Kubota¹, Hisao Kuroda¹, Keitaro Fukushima², Ryoji Nakazato¹, Syunichi Matsumoto³, Keita Nakagawa³, Yasuko Kitami³, Tetsuro Kikuchi³, Mirai Watanabe⁴, Naohiro Imamura⁵

¹Ibaraki University, ²Kyoto University, ³Ibaraki Kasumigaura Environmental Science Center, ⁴National Institute for Environmental Studies, ⁵Forest Research and Management Organization

Although atmospheric deposition of atmospheric ammonia (NH₃) emitted from agriculture and livestock areas causes nitrogen loads around the NH₃ source, datasets of NH₃ concentration are still limited and increase the uncertainty in estimating nitrogen loads over the basin in Japan. Since June 2017, we have developed the monitoring network of NH₃ concentration at thirteen locations in Kasumigaura-basin in Ibaraki. The network is based on monthly low-cost observational method using widely used passive samplers and ion chromatography. The preliminary results showed a large difference in temporal variations of observed NH₃ concentration among the locations; the variation was particularly high at the locations close to the emission source. Through a continuous observation in the present network, nitrogen loads via atmospheric deposition of NH₃ will be estimated in Kasumigaura-basin and a nitrogen-saturation forest in Mt. Tsukuba in Ibaraki.

Keyword: regional atmospheric environment practices, nitrogen and phosphorus cycle, point and non-point source pollution

O5-4 LOCAL-SCALE SPATIAL DISTRIBUTION OF ATMOSPHERIC AMMONIA CONCENTRATION AND DEPOSITION AROUND A CATTLE FEEDLOT

Tomohiro Kubota¹, Genki Katata², Keitaro Fukushima³, Hisao Kuroda⁴

¹Ibaraki University Graduate School of Agriculture, ²Institute for Global Change Adaptation Science of Ibaraki University, ³Center for Ecological Research, Kyoto University, ⁴Ibaraki University College of Agriculture

Atmospheric ammonia (NH₃) emitted from the feedlot and agricultural sources causes nitrogen loads to the basin through dry deposition, which is the phenomenon that gaseous materials are captured at the vegetative surface due to turbulent exchanges. To estimate dry deposition amount of NH₃, field observation of spatial distribution of NH₃ concentration is important, although such data is currently very limited in the Kasumigaura basin in Ibaraki, Japan, where agricultural land use is popular. In the present study, a multi-point observation of monthly NH₃ concentration was carried out inside and around the cattle feedlot in Ibaraki University using several passive samplers from 23 May 2017 to 21 February 2018. Dry deposition amount was then estimated based on the inferential method by multiplying observed NH₃ concentration and modelled deposition velocity. Wet deposition of NH₄⁺ was also observed by a bulk sampler. The results revealed that measured NH₃ concentration was high when the percentage of downwind of the cattle feedlot was high at observational points during each sampling period. At the location of 50 m leeward of the feedlot, nitrogen load due to dry deposition of NH₃ reached 31% of that due to wet deposition of NH₄⁺. This indicates that dry deposition of NH₃ released from the cattle feedlot may contribute to the total nitrogen load to the basin that includes huge agricultural areas.

Keyword: nitrogen and phosphorus cycle, point and non-point source pollution, regional atmospheric environment practices

O5-5 STATUS OF NITRATE POLLUTION IN GROUNDWATER OF THE TOMOE AND HOKOTA RIVER BASINS (IBARAKI, JAPAN) AND ITS CAUSES

Tetsuro Kikuchi¹, Takao Ouchi^{1,2}, Ayato Kohzu³, Takehiko Fukushima¹

¹Ibaraki Kasumigaura Environmental Science Center, ²Environmental Management Division, Ibaraki Prefecture (present affiliation), ³National Institute for Environmental Studies

The Tomoe and Hokota Rivers flow into Lake Kitaura (Ibaraki, Japan), and in the basins of these rivers, groundwater concentrations of nitrate- and nitrite-nitrogen (NO₃-N + NO₂-N) have exceeded the applicable environmental quality standard (10 mg/L) at several wells, since 1998. In November 2016, the authors conducted a groundwater quality survey at eight wells in the basins, to document the status and examine the causes of this nitrate pollution. Concentrations of NO₃-N + NO₂-N exceeded the environmental quality standard at five wells, and at two of these, located in the upstream region of Tomoe River, the concentrations exceeded 20 mg/L. At four wells, NO₃-N + NO₂-N concentrations have been higher than the environmental quality standard since 2009, and they have been almost stable at this raised level or slightly increasing for the last two years (2014-2016). Analytical results on the composition of major inorganic ions and stable isotope ratio of NO₃-N inferred that chemical fertilizers (e.g., ammonium sulfate) and manure soil amendment added into the dry fields in the basin catchment areas are the main causes of nitrate pollution in affected groundwater.

Keyword: Nitrogen and phosphorous cycling, Point and non-point source pollution, Land use management

Technical Session 5: Regional Activities and Matter Cycles Section 2: Nitrogen Contamination and Ammonia Volatilization

O5-6 APPLICABILITY OF THE VIRTUAL NITROGEN FACTOR (VNF) OF NITROGEN FOOTPRINT CALCULATION AS AN INDEX OF NITRATE LEACHING IN DIFFERENT HORTICULTURAL CROPSTakeru Gonai¹, Iwao Terakado¹, Sadao Eguchi²¹Horticultural Research Institute, Ibaraki Agricultural Center, ²NARO Institute for Agro-Environmental Science

Nitrogen (N) is an essential macro-nutrient to plant; however, excessive N fertilization to crops can cause various environmental problems. In Ibaraki prefecture, various techniques to reduce N fertilization have been developed for reducing farmer's cost and environmental impacts. We developed a literature database containing monitoring data of N fertilization, crop N uptake, N harvest, etc., obtained from field experiments conducted in Ibaraki prefecture, and calculated virtual nitrogen factor (VNF) defined as the ratio of consumed N to total N loss to the environment during food production to consumption processes in the N footprint calculation. We also examined the relationship between VNF and nitrate leaching and found that, in leaf vegetables, reduced N fertilization led to decrease in both nitrate leaching and VNF; on the other hand, in root vegetables, such relationship was unclear because reduced N fertilization did not necessarily lead to decrease in nitrate leaching. Moreover, applicability of VNF as an index of nitrate leaching was generally limited in the same field or same experimental conditions. These results suggest that VNF is valid as an index of nitrate leaching when applied to some types of crops such as leaf vegetables under the same farmland conditions to compare the effects of reduced N fertilization. Further study is needed to elucidate why reduced N fertilization in root crop did not lead to decrease in nitrate leaching before discussing the VNF applicability.

Keyword: nitrogen and phosphorus cycle, food production

Technical Session 5: Regional Activities and Matter Cycles Section 3: Water Purification Measures**O5-7 UTILIZATION OF COVER CROPS FOR SOIL AND WATER CONSERVATION**Yingting Gong¹, Peiran Li¹, Masakazu Komatsuzaki²¹University of Ibaraki, ²Center for International Field Agriculture Research and education

Residual fertilizer nitrogen (N) in soil represents a potential environmental contaminant because of the risk of nitrogen leaching into ground water. Winter cover crops can conserve residual soil N. Soil organic carbon (SOC) has various roles in producing crops and improving their environment. Cover crop is a potential method for conserving or increasing SOC. However, the effectiveness of utilization of cover crops for soil and water conservation has not been clear yet. This study compared dry matter (DM), N content, N accumulation, soil organic C and N in different soil layers (0-2.5, 2.5-7.5, 7.5-15 and 15-30 cm) among different cover crops, including fallow (native weeds), hairy vetch (legume cover crop) and rye (grass cover crop) in soybean production to investigate the effect of cover crops on C and N dynamics in agroecosystem. The results showed that rye had significantly higher dry matter than fallow and hairy vetch, and it also had the highest N accumulation. However N content in rye was significantly lowest, there was no significant difference between fallow and hairy vetch. Soil organic C and N content were higher in rye and hairy vetch compared to fallow in each depth. Soil organic C and N content were significantly higher in 0-2.5 and 2.5-7.5 in relative to 7.5-15 and 15-30 cm layers. These results indicated that cover crops can improve N accumulation and increase soil organic C and N content, it should help inorganic fertilizer of farm.

Keyword: cover crop, carbon, nitrogen, soil and water conservation

O5-8 IMPROVEMENT OF NITROGEN REMOVAL RATE ESTIMATION METHOD FOR WETLANDS FOCUSED ON TEMPERATURE FACTORSXiaolan Lin¹, Hisao Kuroda², Koshi Yoshida², Maeda Shigeya²¹The United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology, ²College of Agriculture, Ibaraki University

The nitrogen removal equation for paddy fields is that $R = a \cdot C$. Where is the nitrogen removal rate(R), nitrate nitrogen concentration(C) and nitrogen removal coefficient (a). "a" is $a = 0.00002 \cdot \text{Temperature}(T)^2 + 0.005$ under light condition. This equation is an empirical formula obtained under constant temperature test. We investigated the temperature of nitrogen removal coefficient for practical applications. The investigation was carried out almost every week from January 2015 to December 2016. Investigated items are flow rates (inlet / outlet), T-N concentrations and water temperatures (inlet, center, outlet), and soil temperatures (at central part, 1 cm interval in the depth direction to 10 cm). We also used AMeDAS (Automated Meteorological Data Acquisition System) temperature data about 10 km away from the site. The results of the investigation showed that nitrogen removal rate was more related to soil temperature of 10 cm depth or the average integrated time temperature from AMeDAS temperature data than the water temperature at the time of investigation. Calculating the nitrogen removal rate at this temperature will reduce the error. Therefore, it was calculated by multiplying the average integrated time temperature of the nitrogen removal equation by the temperature factor. As a result, the best result was obtained when the average integrated time temperature (light condition) and the temperature factor 1.3 are used.

Keyword: wetland, nitrogen removal rate, temperature factor

O5-9 VERIFICATION OF A SIMPLE WATERSHED LAND-USE MODEL TO ESTIMATE THE NET NUTRIENT LOADS FROM NON-POINT SOURCES TO RIVERSSeiko Yoshikawa¹, Yuta Shimizu², Kenji Matsumori²¹Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization, ²Institute for Agro-Environmental Sciences, Western Region Agricultural Research Center

The aim of this study was to evaluate the impact of land-use on total-nitrogen and total-phosphorus concentrations in river water (R-N and R-P). The study area consisted of 13 watersheds covering about half of Hokkaido, and 12 watersheds covering about half of Tohoku and those 12 sub basins in Japan. We estimated N and P specific load factors, which showed the magnitude of the upland fields, paddy fields, forests and urban land-use contributions to R-N and R-P. The N and P specific load factors were gained as partial regression coefficients using a multiple regression analysis of the R-N and R-P concentrations and the land-use ratios in each of the watersheds. The results showed that The N specific load factor was -2.4, 2.4, 0.1, and 39.8 for the watersheds in Hokkaido, 2.9, 9.8**, 0.49, and -6.8 for the watersheds in Tohoku, and 1.2, 6.7, 0.4, 4.3 for the sub watersheds in Tohoku for paddy, upland, forest, building site, respectively. The P specific load factors were 0.08, 0.07, 0.02, and 1.4 for the Hokkaido watersheds, 0.20**, 0.23**, 0.00, and 0.01 for the Tohoku watersheds, and 0.15, 0.10, 0.00, and 0.80* for the Tohoku sub watersheds for paddy, upland, forest, building site, respectively (* 5% **, 1% significance). The surplus-N (nitrogen applied to cropland via fertilizer without being absorbed by crops) was found to be gently correlated to R-N by a non-linear curve with a contribution rate R^2 of 0.43 in spite of a simple calculation.

Keyword: watershed land-use model, specific load factor, non-point source, nitrogen, phosphorus

Technical Session 5: Regional Activities and Matter Cycles Section 3: Water Purification Measures

O5-10 EVALUATION OF NUTRIENT LOAD REDUCTION BY PRECISION WATER MANAGEMENT FROM PADDY FIELD IN LAKE INBANUMA WATERSHED

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In this study, the impact of nutrient load reduction by precision water management was evaluated to improve the water environment of Lake Inbanuma. Kashima district, which was managed by Inbanuma land improvement district, was selected for the test site. Water, nitrogen and phosphorus concentration was monitored at lino pumping station and paddy drainage. From the monitoring data, water balance and nutrients balance were estimated. As a result, precision water management by automatic irrigator can reduce 65% of irrigation water, 58% of nitrogen load and 43% of phosphorus load.

Keyword: water environmental conservation, nitrogen runoff, phosphorus runoff, automatic irrigation

O5-11 ANALYSIS OF WATER AND NUTRIENT MOVEMENT IN A CYCLIC IRRIGATION SYSTEM TO PADDY FIELDS

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¹Department of Biological and Environmental Engineering, ²Kanto Regional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries

Imbanuma basin at Chiba Prefecture has had problem of deterioration of water quality in recent years. For the way to improve that circumstance, cyclic irrigation is proposed. In a cyclic irrigation system, drainage water discharged from paddy field is pumped and reused as irrigation water. Cyclic irrigation is expected to decrease the pollution load because it decrease the amount of drainage water flowing to lake, and because some of the nutrition in drainage water will be returned to paddy field. The purpose of this research is to evaluate quantitatively for effect of decreasing the pollution load for Imbanuma basin in this irrigation system. For that purpose we did three analysis. First, we analysis record of a storage pump and a map of drainage canal. And we know that fifty-one percent water is reused water out of total irrigation water and that fifty-seven percent of paddy field is joined to the storage pump. Second we found for relation between water quality and precipitation or farmer's work. Especially we found relation with fertilization but it was based on examination of water implemented only once a month. So we had also conclusion that such examination is need to be had more often. Last we made a model of water movement. That model is composed the tank model and model of shape of drainage canal. This model output water level of drainage canal. It can reproduce the water level so roughly, but need to be improved.

Keyword: cyclic irrigation, paddy field, nutrient load, lake environment, drainage canal

O5-12 ASSESSMENT OF BLOCK SCALE RECYCLE IRRIGATION SYSTEM APPLICATION TOWARD WATER ENVIRONMENTAL CONSERVATION IN BOTH WATERSHED AND PADDY FIELDS SCALES AT SHINTONE RIVER BASIN IN KASUMIGAURA

Tasuku Kato¹, Shuhei Ikeda¹, Tsugio Naoe²

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As Kasumigaura watershed, water ecosystem in lake is tempraliliy better to promote domestic sewage system. However, water quality is not so improved as expected. Possibly, this comes from excess fertilizer or nutrient storage in soils, and the stored pollutant loads is continued to influence in long term. Then, counter measures of water quality improvement is expected to improve agricultural drainage. Circulated irrigation use of agricultural drainage water is considered as one of effective counter measures. For evaluation of pollutant loads discharge and water quality purification effect when applied circulated irrigation scheme, case study was conducted in Shintone irrigation district in Kasumigaura basin. Monitoring system was installed and hourly measured water amount and water quality, electric conductivity (EC). Water and EC material balance was analyzed, and scenario analysis is presented in case of circulated irrigation scheme were installed. Monitoring period is 2017 January to December.

Keyword: paddy fields, circulated irrigation scheme, water quality purification, scenario analysis

O5-13 TO REDUCE DRAINAGE NUTRIENT LOAD FROM PADDY FIELD BY NON-DRAINAGE TRANSPLANTING WITH GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER AT OGATA-MURA 1 NON-DRAINAGE TRANSPLANTING FIELD TEST WITH GNSS STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER

Yoshisada Nagasaka², Hayato Shindo³, Masaya Kato³, Masanori Saito³, Tadashi Kondo¹, Satoshi Yamamoto¹, Kouki Fujiwara⁴, Yukio Yaji¹

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Eutrophication is progressing at Hachiro Lake around Ogata village in Akita Prefecture, reducing the environmental burden is an important issue. It is possible to reduce environmental burden when farmers don't discharge turbid water from paddy fields after puddling. We built RTKGNSS reference station in Ogata village and made transplanting operation using GNSS assisted auto-steered rice transplanter without discharging turbid water. The lateral deviation from the desired straight path was less than 5 cm. This accuracy is as same as veteran operator without auto-steering. Miss plant rate was 0.3 % at 30 mm depth of water and 0.7% at 43 mm. We don't obtain the difference of transplanting depth and initial growth between water discharged field and non-discharged field. The yield and quality of rice are also as same.

Keyword: nitrogen and phosphorus circulation, point source and non-point source, land use management, food production

O5-14 TO REDUCE DRAINAGE NUTRIENTS LOAD FROM PADDY FIELD BY NON-DRAINAGE TRANSPLANTING WITH GLOBAL NAVIGATION SATELLITE SYSTEM(GNSS) STRAIGHT-AHEAD ASSIST RICE TRANSPLANTER AT OGATA-MURA FOR IMPROVING THE WATER ENVIRONMENT OF LAKE HACHIROKO

Tadashi Kondo¹, Yoshisada Nagasaka², Hayato Shindo³, Masaya Kato³, Masanori Saito³, Koki Fujiwara⁴, Yukio Yaji¹

¹Akita Prefectural University, ²Tohoku Agricultural Research Center, NARO, ³Akita Prefectural Agriculture Experimental Station, ⁴Ogata agricultural cooperatives

Lake Hachiroko is the adjustment reservoir for the reclaimed land, and its area is about 45 km². Since the reclamation 54 years ago, due to wastewater loads such as fertilizer components, which mainly cause agricultural land drainage, it has severe water pollution problems of eutrophication.

We measured the inflow and outflow of the nutrients load on the Hachirogata reclaimed land and determined the daily net discharge load. The net discharge load of the reclaimed land from a year, 2017 (157 km² including 100 km² paddy field) was 3.5×10^5 kg of nitrogen (N), 6.1×10^4 kg of phosphorus (P), 2.4×10^7 kg of suspended solid (SS).

In addition, we measured the amount of pollutant load reduction in farmers' field. It will also reduce wastewater and make effective use of water resources. Precise measurement of water quantity and water quality was carried out and the load amount was measured. The results are as follows. The water depth of non-drainage GNSS transplantation was about 30 mm, and the water saving amount was about 25 mm. Nitrogen 1.6 kg / ha, phosphorus:0.30 kg / ha and SS:150 kg / ha was reduced in discharge load due to falling water.

At the central reclaimed land there were net discharge loads of N: 7.4 kg / ha, P: 1.6, SS: 810 kg / ha in May. The load reduction effect on Hachiro Lake by non-drainage transplant using GNSS straight-ahead assisted rice transplanter were estimated N: 22%, P: 19, SS: 18%.

Keyword: Nitrogen and phosphorus circulation, point source and non-point source, land use management, food production

Technical Session 5: Regional Activities and Matter Cycles Section 5: Forest Management

O5-15 FORMULATION OF FOREST MAINTENANCE GUIDELINES FROM THE VIEWPOINT OF CONSERVATION AND REGENERATION OF LAKE BIWA

Osamu Tanaka

Shiga Prefecture

The forest of Shiga Prefecture occupies about half of the prefecture soil, and plays a big role as a water source forest of Lake Biwa. In recent years, the disappearance of forest floor vegetation and the soil outflow caused by deer in addition, new problems such as the slope failure caused by localized torrential rains, the occurrence of driftwood and sediment erosion, etc., are affecting the environment of Lake Biwa, a closed water area. On the other hand, artificial forests are becoming more and more fulfilling as forest resources during the period of use. In order to use this forest resource appropriately and to maintain the forest to meet new challenges at the same time, it is urged to have more consideration for the environment of Lake Biwa than ever before. So this time, I stood in view of the conservation and regeneration of Lake Biwa, in order to properly implement forestry production activities, we have decided to show the guidelines for forest development based on three perspectives (from the viewpoint of sustainable resource use, the viewpoint of the countermeasures against driftwood and sediment, and the viewpoint of maintaining the water supply and nutrition function). In the guideline, the location conditions of the water source forest of Lake Biwa were arranged, and the basic idea of the forest maintenance was shown, and it was described that it was important to practice this.

Keyword: forest management

O5-16 SOIL ENVIRONMENTAL CONDITION AND VEGETATION RECOVERY OF THE ABANDONED CROPLAND AROUND KOMADO-SHITSUGEN MOOR, FUKUSHIMA PREFECTURE

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In the area around Komado-Shitsugen moor, beech forest was reclaimed to be the agricultural fields to increasing the vegetable productivity in 1950s and abandoned until 2000. Reforestation activities started from 2000, however, in some area, planted beech trees shows poor growth, and the area is still covered by Japanese pampas grass. In this study, we surveyed soil environmental condition in beech forest area, abandoned cropland area and transit area to reveal the factors inhibit the growth of beech trees. Topographical measurement, vegetation survey and soil sampling were carried out at 10 × 30 meter quadrat containing forest area, transit area and grassland area. From the edge of forest to the edge of grassland, soil profiles survey was examined in every 10m. At the profile 3, which might be affected by field grading, the top soil under bamboo grass showed relatively brownish color and moderate carbon content. On the contrary, at the profile 4 under the grassland, organic A horizon was not detected and the top soil showed brown color and low carbon content which resembles to the subsurface soil of beech forest. From these results, bamboo grass in transit area was possibility related to the formation of surface A horizon, and naked subsurface soil under the grassland supposedly inhibit the growth of planted young beech trees.

Keyword: abandoned cropland, beech forest, Komado-Shitsugen moor, soil genesis, vegetation management

Technical Session 5: Regional Activities and Matter Cycles Section 6: Phosphorus Cycle**O5-17 PHOSPHORUS RUNOFF LOADS FROM PADDY FIELDS AND FORESTED WATERSHEDS IN SENGARI RESERVOIR BASIN**

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In Sengari Reservoir supplying domestic water to Kobe city, Japan, total phosphorus (TP) concentration remains higher than a prescribed environmental standard value. Field survey was conducted to estimate TP loads emitted from a paddy field and from a forested watershed in the reservoir basin, measuring TP concentration and discharge in an agricultural drainage canal as well as in a mountain stream. The two measurement points were located 6.2 km apart in different sub-catchment basins of the reservoir. Water samples were collected once a week during the irrigation season (from May to mid-September) and also occasionally in rainy days during the non-irrigation season. Data loggers were operated to record water depths with an interval of 10 minutes, to determine the discharges with relevant hydraulic methods. The total TP loads from the paddy field were estimated at 6.0 kg/ha and at 6.2 kg/ha during the irrigation and the non-irrigation seasons, respectively, while that from the forested watershed was estimated at 0.49 kg/ha. As a result of hydrological analysis, it is concluded that less frequent heavy rainfall events cause significant intensification of TP loads both from the paddy field and from the forested watershed.

Keyword: Phosphorus, Paddy, forest, Sengari reservoir

O5-18 OBSERVATION AND MODELING OF PHOSPHORUS RUNOFF LOADS FROM SENGARI RESERVOIR BASIN

Junichiro Takeuchi, Keitaro Goto, Baobab Kibet Kimengich, Masayuki Fujihara

Graduate School of Agriculture, Kyoto University

Sengari Reservoir basin, Hyogo Prefecture, Japan, is an agricultural watershed dominated by a mountainous area, and has a problem of water quality, especially of phosphorus, in Sengari Reservoir. In the basin, temporal and spatial distribution of phosphate-phosphorus ($\text{PO}_4\text{-P}$) concentration along the rivers flowing into the reservoir was investigated regularly. From the measured results, it was found that $\text{PO}_4\text{-P}$ is high during the irrigation period specifically in sub-basins where domestic waste water is treated by septic tanks, although $\text{PO}_4\text{-P}$ is low throughout the year in sub-basins where domestic waste water is treated in rural sewages. With the measured data and GIS data of landuse and altitude, linear multiple regression models whose explanatory variables are the area ratio of landuse type to the catchment area of a sampling point, the area ratio of the catchment area of the sampling point to the whole area of the sub-basin, and a dummy variable that distinguishes between rural sewage and septic tank sub-basins were formulated. The estimated $\text{PO}_4\text{-P}$ distribution along rivers shows good agreement with the measured one except for some outliers, and the obtained coefficients imply that Paddy Field and Residential Area are major source of $\text{PO}_4\text{-P}$.

Keyword: phosphate phosphorus, linear multiple regression model, landuse, unit load

O5-19 THE SECULAR CHANGE OF PHOSPHORUS CONTENT IN SEDIMENT OF LAKE SUWA

Yutaka Ichikawa, Akane Yoshihara, Yuichi Miyabara

Shinshu University

In order to clarify the secular change of phosphorus content in sediments and dynamics of phosphorus in Lake Suwa, we determined the fractional phosphorus at 22 sites in Lake Suwa. Compare with the content at the latter half of the 1970s, that content of phosphorus decreased by ca.40%. It is reflected the diffusion of sewage in the watershed and the reduction of the phosphorus load to Lake Suwa. Especially, Non-apatite phosphorus was decreased considerably during this period. Non-apatite phosphorus concentration difference was large between observation sites. Non-apatite phosphorus was found to have a strong negative correlation with the sediment particle size, and it was presumed that non-apatite phosphorus behaved with fine particles.

Keyword: Nitrogen, Phosphorus cycle, Lake Suwa, sewerage, sediment

O5-20 CHEMICAL SPECIES AND BIOAVAILABILITY OF PARTICULATE PHOSPHORUS FROM SOILS

Haruka Adachi, Yohey Hashimoto

Tokyo University of Agriculture and technology

Rice paddy fields are one of the large non-point sources of P effluent to river and lake systems. Phosphorus in the soil and water is present as dissolved and particulate (colloidal) forms, and they are different in bioavailability to cyanobacteria. Elucidation of the forms of P in the soil is therefore essential to manage the water quality and predict the occurrence of eutrophication in water bodies. The objective of this study was to investigate P species in the bulk and colloidal fraction of paddy soils and how the P species relate to the growth of cyanobacteria. Our study revealed that P in the soil colloid with the size ranging from 20 to 1000 nm was mainly associated with iron (Fe) and aluminum oxides. The growth of *Synechococcus* sp. was temporally retarded by the presence of P associated with Fe oxides. Iron oxides in the soil may play an important role in retention and transport of P and is also related to bioavailability to cyanobacteria.

Keyword: phosphorus cycle, eutrophication, nonpoint source, bioavailability

Technical Session 5: Regional Activities and Matter Cycles Section 7: Biomass**O5-21 FORMULATION OF MULTIPLE 'RESOURCES-FROM-BIOWASTE SYSTEM' MODELS BASED ON SUBCRITICAL WATER REACTOR**Jun Matsushita

Professor, R/D Initiatives of Chuo University

Massive biowaste generation causes serious environmental degradation due to low-cost landfill system for its disposal commonly applied in most Asian countries. We assumed that an appropriate solution was formulation of multiple 'resources-from-biowaste system' as alternative measures through the functional hydrolysis processing based on a subcritical water reactor. Whereas, a wide range of socio-economic benefits could be expected in our society, if well-linked with value-added organic farming, as follows: (1) production of functional compost and recovery of ever-depleted phosphorus resources, (2) heightening of resource efficiency in biowaste management and (3) contribution to mitigating serious eutrophication in the public waters and so forth. Hereupon, we firstly analyzed functions of the subcritical water reactor, and secondly conducted actual project-based R/D study to verify the feasibility and availability on the leading system models formulated by the subcritical water reactor.

Keyword: resources-from-biowaste, subcritical water reactor, clean cycle, mitigating of eutrophication

O5-22 WATER QUALITY CONSERVATION BY CIRCULATIVE USE OF BIOMASSYoshito Yuyama, Masato Nakamura, Fumiko Oritate, Masaru Yamaoka

National Agriculture and Food Research Organization

Some rural areas have problems of water pollution in lake, pond, river and canal no good for human life, irrigation and ecosystem. Most reasons come from insufficient recycle of nitrogen and phosphorus contained in various biomass and water as well as fertilizing design. Authors have developed diagnosis tool for regional biomass use that show present and planned material balance. Objective feedstock biomass is such as livestock wastes, residues of food and sludge. This study dealt with methane fermentation technology. Katori city of Japan and Thai My village of Vietnam were chosen as case study area and the effect by plan with some scenarios were quantified. The results indicated how the use of chemical fertilizer, disposal and influent load to water bodies decreased by circulative use of biomass. Appropriately designed and managed biomass use system can contribute to water quality conservation, sound material cycle, creation of value-added food production and vitalization of regional economy throughout local production for local consumption.

Keyword: biomass, nitrogen and phosphorus cycle, food production

O5-23 DEVELOPMENT OF SLUDGE REDUCTION SYSTEM USING AQUATIC PLANT BIOMASSYukiyo Yamasaki, Yuji Okayasu, Hiroyuki Shigemura

Public Works Research Institute

Aquatic plants grow thickly because of eutrophication in rivers and lakes. This influences our lives, because the plants may create an unpleasant odor, act as obstacles in navigation, decrease biodiversity etc. Therefore, more effective measures are needed to eliminate and utilize aquatic plant biomass effectively. Thus, we assessed the feasibility of using aquatic plant biomass to reduce water content of sewage sludge. Here, we used dallisgrass (*Paspalum*) and water caltrop (*Trapa japonica*) for reducing the sludge water content. We observed that sludge mixed with flocculant and water caltrop had a significantly reduced water content compared with sludge containing no water caltrop. Also, the volume of dewatering sludge mixed with flocculants and water caltrop was reduced comparing with that not mixed with any aquatic plants. Additionally, according to calculations, it was demonstrated that reaped aquatic plants in the south area of Lake Biwa by the Sewage Works Department could be consumed in approximately 10 days or less by using them as a dehydration aid in wastewater treatment plants. The utilization of aquatic plants as a dehydration aid in wastewater treatment plants is effective and can be applied by the Sewage Works as well as Lake Departments.

Keyword: Aquatic plant, Sludge, A dehydration aid, Biomass

O5-24 NITROGEN MINERALIZATION IN PADDY SOIL TREATED WITH THE SLUDGE FROM LOW-TEMPERATURE ANAEROBIC DIGESTION

Masato Nakamura¹, Taira Hidaka², Masaru Yamaoka¹, Fumiko Oritate¹

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Anaerobic digestion (AD) is a technology that stabilizes wastes such as manure, sludge or food wastes through biological activity in an oxygen-free environment with concomitant production of biogas containing approximately 60% methane. Although sewage sludge discharged from wastewater treatment plants is expected to be feedstock of AD and used in large-scale plants, use in small-scale plants is limited due to low energy and economic efficiency. AD under lower temperature conditions than normal (35 ° C) and the use of digested sludge as a fertilizer are promising as an energy and economic efficiency improvement technology. However, there is little information available on the influence of digestion under low temperature condition on characteristics of sludge as a fertilizer. In this study, we conducted incubation testing to examine the characteristics of nitrogen mineralization in paddy soil treated with the sludge from low-temperature anaerobic digestion (15, 25, 30°C). The results indicated that only a small amount of ammonium nitrogen (3 to 13%) was released from anaerobically digested sludge after application under all low temperature conditions. Therefore, an appropriate rate of application of anaerobically digested sludge can be determined based on the ammonium nitrogen in the sludge. Moreover, it is possible to prevent additional nitrogen load on river or lake by conducting appropriate design for sludge application.

Keyword: Anaerobic digestion, Digested sludge, Liquid fertilizer, Design for fertilizer application, Nitrogen load

Technical Session 5: Regional Activities and Matter Cycles Section 8: Chemical Substances**O5-25 RISK ASSESSMENT OF PERSISTENT ORGANIC POLLUTANTS IN A SMALL CATCHMENT**

Maoheng Zhang, Fangfang Wang

Nanjing Normal University

To evaluate the relative ecological risk of harmful pollutants in the sediments of a small catchment, the concentrations of persistent organic pollutants (POPs) in the sediments were measured. Results show concentrations of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) were in the range of 2.7-82.2 $\mu\text{g}\cdot\text{kg}^{-1}$, 0.11-0.59 $\mu\text{g}\cdot\text{kg}^{-1}$ and 1.12-2.83 $\mu\text{g}\cdot\text{kg}^{-1}$, respectively. A potential negative impact on the ecological environment in the region was found.

Keyword: sediment, persistent organic pollutants, risk assessment, catchment

O5-26 LONG TERM MONITORING OF RADIOCESIUM IN SOYBEAN FIELD, LAKE KASUMIGAURA BASINPeiran Li¹, Yingting Gong¹, Masakazu Komatsuzaki²¹College of Agriculture, Ibaraki University, ²Center for International Field Agriculture Research and Education

The nuclear accident at Fukushima Dai-ichi Nuclear Power Plant (FDNPP) occurred as a consequence of the massive earthquake and associated tsunami on March 11, 2011, which was the first nuclear power plant accident in Asia. A long term monitoring of radiocesium content in soybean and cover crops was conducted from 2011 to 2017 in soybean field (~170km from FDNPP), Lake Kasumigaura basin, to clarify the changes of radiocesium in soybean and cover crops. From 2011 to 2017, soybean was cultivated from July to October and Cover crops (fallow weeds, FA; rye RY; and hairy vetch, HV) was cultivated from October to June with three tillage systems (moldboard plow, MP; rotary cultivation, RC; and no tillage, NT). Radiocesium content declined steadily in soybean grain from 2011 to 2014, however, this reduction slowed down from 2014 to 2017. Comparing with in MP and RC, radiocesium content in soybean grain under NT system was consistently higher in every year. Radiocesium content in three kind of cover crops also decreased sharply from 2011 to 2014 and became stable since 2015. radiocesium content in rye was consistently lower than hairy vetch and fallow weeds. This research revealed that tillage can continuously reduce the radiocesium content in soybean grain for a long term, although in NT system still showed higher radiocesium content in soybean grain in Lake Kasumigaura basin.

Keyword: radiocesium, soybean, tillage, cover crop

O5-27 THE DISTRIBUTION OF ANTIBIOTIC-RESISTANT BACTERIA IN EUTROPHIC LAKE KASUMIGAURA AND NEIGHBORING AGRICULTURAL FIELDS

Momo Yayou, Akinori Hirano, Yuki Matsuda, Kento Uehara, Tatsuya Imai, Makoto Shimabukuro, Hisao Kuroda, Hiroyuki Ohta, Tomoyasu Nishizawa

Ibaraki University

There has been increased concern the outbreak of bacteria possessing antibiotic-resistant into the natural environment these days. Our research group has investigated the distribution and dynamics of antibiotic-resistant bacteria in eutrophic Lake Kasumigaura, Japan and neighboring agricultural fields to date. A veterinary drug tetracycline, which is well-known as a respectively inexpensive antibiotic, has an effect against contagious diseases and extensive usage as feed additives in the livestock industries. In the current study, we showed that the tetracycline-resistant bacteria belonging to the class *Gammaproteobacteria*, *Betaproteobacteria*, and *Alphaproteobacteria* commonly obtained, indicating that these bacteria dominantly existed in the waterbody near the Lake Kasumigaura and its neighboring agricultural field soil. Our results suggested that indigenous bacteria possessing the tetracycline-resistant are widely distributed in the Lake Kasumigaura ecosystem.

Keyword: land use management, food production, antibiotic-resistant bacteria, tetracycline, organic fertilizer

TS6-1 LAKE MASHU - HOW WE REVEALED ENVIRONMENTAL RECORDS FROM A SENSITIVE AND STABLE LAKE

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Lake Mashu is a dimictic caldera lake located in the eastern part of Hokkaido, Japan. It is a typical closed lake with no inflowing nor outflowing rivers. In 1931, Lake Mashu recorded 41.6 m of Secchi disk transparency, which has been the largest transparency record exceeding that of Lake Baikal. There is no anthropogenic pollution sources including agricultural nor forestry activities inside the watershed. For example, concentrations of heavy metals and persistent organic substances in lake water are extremely low. Therefore the detection of trace components itself was a challenging monitoring objective and it can be said that Lake Mashu is a unique field for the environmental scientists. Lake Mashu is the sole lake registered as a baseline monitoring station in Japan at the UNEP GEMS/Water programme. Physical, chemical and biological observation by the National Institute for Environmental Studies and collaborating institutions is the only scientific monitoring of water qualities for the last three decades.

Three findings about the lake monitoring will be provided. 1) A mechanism of formation of large transparency, and reproduction of seasonal variation of transparency by planktonic evidences and continuous logging data in the severe environmental conditions. 2) An estimation of long term variation of lake water constituents through the isotopic and gaseous analysis of water balance and accurate and/or sensitive analytical methods for elements. 3) Examination of longer term environmental changes by a precise measurement of lead isotope ratios.

Technical Session 6: Monitoring Based on Scientific Knowledge Invited Lecture**TS6-2 INTEGRATED DATA, MODELS AND NETWORKS
PROVIDE OPPORTUNITIES TO ADVANCE LAKE
SCIENCE AND PREDICTIONS****David Hamilton, Marieke Frassl**

Australian Rivers Institute, Griffith University

The challenge to manage lakes under global change trajectories of increasing diffuse nutrient pollution, climate change and invasive species is intensifying. Network-based science will have an increasingly important role in addressing these threats to the sustainability and service provisions of lakes. Network science can increase the number and breadth of case studies, provide greater interdisciplinary coverage, and advance the uptake of novel technologies like high-frequency sensor monitoring. The Global Lake Ecological Observatory Network (GLEON) uses network-based science to seek to understand and interpret high-frequency sensor data from lakes across the world. Complimenting networks are databases like LAGOS-NE and Takiwa, which provide geospatially and temporally resolved databases for lakes at national scale (USA and New Zealand, respectively). New sensing technologies and practices, as well as greater accessibility of this information, are leading to dissemination of best practice approaches and implementation of systems to avoid 'reinventing the wheel' in terms of data acquisition and modelling tools. Global networks of researchers are well positioned to address the challenges of increasing availability of high frequency data but the synthesis studies that are enabled by these networks need to be directed towards improved process representations as well as statistical generalizations. Moreover, societies will continue to play an important role as persistent organizations to promote the profession, provide regular meetings and maintain the standards of disciplinary journals.

Keyword: GLEON, networks, high frequency data, databases, professional societies

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1984 Bachelor of Science, University of Otago (NZ)
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Professional positions

2002-2017 Professor and Bay of Plenty Chair in Lake Restoration, Department of Biological Sciences, University of Waikato, New Zealand
1998-2002 Senior Lecturer, Department of Environmental Engineering, University of Western Australia
1994-1998 Lecturer, Department of Environmental Engineering, The University of Western Australia
1992-1993 Research Associate, Centre for Water Research, The University of Western Australia

Employment record

April 2017 Professor and Deputy Director, Australian Rivers Institute
2002 - March 2017 Professor in the Department of Biological Sciences, University of Waikato.
2002 - March 2017 Bay of Plenty Chair in Lake Restoration, University of Waikato
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1998 - 2002 Senior Lecturer, Department of Environmental Engineering, University of Western Australia
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1991 - 1992 Research Associate, Centre for Water Research, University of Western Australia
1990 - 1991 Post-doctoral Fellow, Department of Zoology, University of Otago

Technical Session 6: Monitoring Based on Scientific Knowledge Section 1: Environmental Monitoring

O6-1 WEB APPLICATION FOR EXAMINING HYDROCLIMATE INFORMATION OF GLOBAL LAKE BASINS: CGLB USING A LATEST WORLD LAKE DATABASE

Tosiyuki Nakaegawa

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More than 1 million of lakes are listed in the upgraded version of Web application, Climates of Global Lake Basins (CGLB). CGLB combines existing datasets and interactively displays geographical, hydrological, and climatological information for hundreds of lakes around the world. CGLB also provides landscape photographs provided by Global Confluence Project as well as quasi-real time monitoring of lake water levels using satellite altimetry provided by U.S. Department of Agriculture. CGLB can interactively create and animate time series of climatological data in a one-dimensional or two-dimensional (geographical) form. The listed lakes in the new version is based on the HydroLAKES provided. Other new features of the CGLB are: interactive drawing lake shapes, topography, land cover type, lake surface temperature, submonthly climatology in ClimatView developed by Japan Meteorological Agency. SQLite is embedded into the end program, allowing more than 1 million entry and search by keywords. These functions are useful for education, expedition planning, and scientific research.

Keyword: lake database, climate variabilities and disaster preventions and reductions, monitoring techniques, modeling, ILBM

O6-2 ENVIRONMETRIC TECHNIQUES FOR SPATIO-TEMPORAL HYDROCHEMICAL CHARACTERIZATION AND POLLUTION SOURCE IDENTIFICATION OF THE DAL LAKE, KASHMIR HIMALAYA, INDIA

Shakil Romshoo, Shabir A. Khanday

University of Kashmir

This research explains the background processes responsible for the spatio-temporal distribution of hydrochemical properties of the picturesque Himalayan Lake, Dal, located in Kashmir valley, India. Univariate and multivariate statistical analyses were used to understand the spatiotemporal variability of 18 hydrochemical parameters collected from 30 sampling sites well distributed within the lake (grid spacing of 1 km²) from March 2014-February 2016. Hierarchical Cluster Analysis (HCA) grouped all the sampled data into 3 clusters based on the hydrochemical similarities. Discriminant analysis (DA) also revealed the same clusters and patterns of the data, validating the results of HCA. Wilk's lambda quotient distribution revealed the contribution of ions, nutrients, secchi disk transparency, dissolved oxygen and pH in the formation of clusters in the lake. The results are in consonance the Principal Component Analysis (PCA) of the whole lake data and individual clusters, which showed that the variance is maximally explained by the ionic component (46.82%) followed by dissolved oxygen and pH (9.36%), nitrates and phosphates (7.33%) and Secchi disk transparency (5.98%). Spatial variability of the hydrochemical variables of the lake is due to the variations in water depth, lake water dynamics, flushing rate of water, organic matter decomposition, and anthropogenic pressures within and around the lake ecosystem. Overall, the water quality of the lake is unfit for drinking due to the presence of coliform bacteria in lake waters.

Keyword: Environmetric, Water Quality Index, Aquatic Vegetatin, GIS, Himalaya

O6-3 USING MULTIMETRIC BENTHIC MACROINVERTEBRATE INDEX FOR THE ASSESSMENT OF RIVER HEALTH IN THAILAND

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Today, the health of streams and rivers has been dramatically changed by anthropogenic disturbances. The Loei River in Loei province, Thailand is one of the Mekong River tributary which affected by many anthropogenic disturbances such as agricultural activities, urbanization and industry. In Thailand, standard water quality is based on chemical measurements, which are not reflect cumulative stressors. Use of multimetric benthic macroinvertebrate index can reflect overall streams and rivers ecological. The aim of this research is to evaluate rivers health by using multimetric benthic macroinvertebrate index. Ten sampling sites were selected to evaluate rivers health. The result showed that Loei river has been threatening by many anthropogenic activity. Thus, river and land use management are urgent need in this catchment.

Keyword: bioassessment, biotic index, multimetric index, Loei river, water quality

Technical Session 6: Monitoring Based on Scientific Knowledge Section 1: Environmental Monitoring**O6-4 ENVIRONMENTAL MONITORING AND ECOTOXICOLOGY FOR TROPICAL ENVIRONMENT: STANDARD AND APPLICATION IN MEKONG RIVER COUNTRIES**Chuleemas Boonthai Iwai

Khon Kaen University

The aquatic resources of the Mekong River are important to support the livelihoods of a large percentage of 60 million who live along the Lower Mekong Basin. The protection of aquatic habitat from damage and understanding of both sensitivities of aquatic organisms to contaminant and ecological effects are needed. Mekong River quality criteria of aquatic life for metals are largely driven by the extremely sensitive small organism's toxicity which should be the Mekong native species. Environmental monitoring and Ecotoxicology of heavy metal (copper) on several tropical freshwater biota was studied using field-collected water from local sites along Lower Mekong Basin in Thailand, Laos and Cambodia, which had different water quality parameters under the tropical environment in the range of total hardness, alkalinity, pH and dissolved organic carbon. The result showed the mortality rate of organisms increased with increasing of copper concentrations and exposure time. The results found that copper toxicity of fish, invertebrates and other aquatic organisms are influenced by water quality parameters such as hardness, alkalinity, pH, and DOC. Copper (Cu) is a big concern for environment, human and aquatic organisms because it can accumulate into plant and animals via food web. The outcoming of this series of laboratory experiment will provide a worst-case scenario and useful for determining the risk assessment of copper on local freshwater organisms in Mekong River Basin in order to help and protect the Mekong River in the future and to set a water quality standard for heavy metal in the Mekong River Basin countries.

Keyword: water quality guideline, Environmental Risk Assessment, water pollution, sustainable development

O6-5 STUDY ON PERIODIC VARIATIONS OF WATER QUALITY IN BRACKISH LAKE HINUMA

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Ibaraki Kasumigaura Environmental Science Center

Located in the central part of Ibaraki Prefecture, Lake Hinuma is a brackish lake connected to the Pacific Ocean via the Nakagawa River. Ibaraki Prefecture has been monitoring water quality monthly at three points in the lake since the 1970s through measurement of Chemical Oxygen Demand (COD). No long-term trend was discernible during the period, however an annual cycle was noted, together with other periodic fluctuations. In due course, wavelet analysis was applied to many water quality fluctuations in the lake, to the inflowing rivers and to the outflowing river, and the dominant water quality cycles were identified and analyzed. As a result, the dominance of the annual cycle was confirmed, and this cycle was interrupted every 7 to 8 years, at which point the seasonal change in COD became negligible for a period. In addition, COD increased during the period when the cycles with a three-year period were dominant. The appearance pattern of the dominant one-year cycle of Lake COD was similar to that for the upstream rivers, suggesting that the COD fluctuations in the lake were strongly influenced by those in the upstream rivers.

Keyword: data analysis and monitoring, wavelet analysis, periodic fluctuation, brackish lake

O6-6 MIXING PROCESSES ASSOCIATED WITH HYPOXIA IN LAKE KASUMIGAURA

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This study reports hypoxia events associated with suppressed vertical mixing during the summer season, Kitaura, Lake Kasumigaura, Japan. Mooring data obtained at the Kamaya monitoring station were used to investigate physical processes causing hypoxia events. Hypoxia appears under conditions of strong stratification due to strong incoming heat flux into the lake. The square of buoyancy frequency (indicator of the stratification strength), N^2 , reaches 2.4×10^{-3} in July, 2016. On the other hand, hypoxia water disappears under weak stratified or mixing conditions when moderate winds ($\sim 5 \text{ m s}^{-1}$) and weak incoming heat flux. The bottom oxygen concentration is highly related with the buoyancy frequency, thus, the bottom oxygen concentration can be explained by the vertical physical mixing processes. In order to evaluate forcing conditions controlling mixing processes in the lake, we propose a non-dimensional number, the ratio of two forcing into the lake, (1) time-integrated incoming heat flux and (2) horizontally-integrated surface wind stress. The non-dimensional number is in a good correlation with the buoyancy frequency. This study found that suppressed vertical mixing causing hypoxia can be simply explained by the balance of the two surface forcings (heat flux and wind stress). In addition, the heat budget analysis shows a contribution of the sediment heat flux to mixing processes in the lake.

Keyword: Hypoxia, Shallow Lake, Vertical mixing, Stratification, Heat flux

Technical Session 6: Monitoring Based on Scientific Knowledge Section 3: Measurement Method**O6-7 MAINTAIN-LESS AND SENSITIVE METHODS FOR ANALYSIS OF WATER-QUALITY UTILIZING REAGENT-FREE PHOTOCHEMICAL REACTIONS**

Tetsuya Nakazato

National Institute of Advanced Industrial Science and Technology

A reagent-free photoreactor for high-efficient mineralization of dissolved organic matter (DOM) and organic arsenic in water samples was developed. The photoreactor penetrated the reaction tube into a mercury lamp that efficiently emits Vacuum UV light at 185 nm. The structure efficiently generated hydroxy radicals from the water in the sample and the radicals promoted rapid mineralization of the organic compounds of carbon and arsenic within 1 min, which included refractory compounds, e.g., humic substances and arsenobetaine. The photoreactor without the use of oxidants or catalysts was useful to maintain-less and low-cost analysis of total organic carbon (TOC) of DOM by non-dispersive infrared radiation detection. The reagent-free photoreactor improved the sensitivity of speciation analysis of arsenic without suppression to the following reductive hydride generation for high-sensitive inductively coupled plasma mass spectrometry. The methods for TOC and arsenic were respectively applied to real samples: DOM in river water samples and arsenic species in human urine.

Keyword: water quality instruments, monitoring technologies for lakes and/or rivers (including remote sensing, GIS)

O6-8 GRAPHENE-BASED ELECTROCHEMICAL SENSOR AS A MICROCYSTIN-LR DETECTION TOOL IN WATERHiroaki Furumai¹, Wei Zhang²¹The University of Tokyo, ²University of South Australian

In this work, we showcased a novel graphene film composite biosensor for microcystin-LR detection as an alternative to time-consuming, expensive, non-portable and often skills-demanding conventional methods of analysis involved in water quality monitoring and assessment. Excellent linear correlation ($R^2=0.99$) of the electron-transfer resistance was achieved over a wide range of MC-LR concentration, i.e. 0.05-100 $\mu\text{g/L}$. As-prepared graphene film composite biosensors can specifically detect MC-LR with remarkable sensitivity and detection limit much lower than the World Health Organization (WHO) provisional guideline limit of microcystin-LR concentration (i.e. 1 $\mu\text{g/L}$) in different water sources. Their great potential can be attributed to large active surface area of graphene film and efficient charge transfer process enabled by their high conductivity. Developed graphene film composite biosensors were also successfully applied to determination of MC-LR in several environmental water samples with high detection recovery. The developed technique offers a promising solution to quick in-situ detection of MC-LR in the contamination point of water source.

Keyword: water quality instruments, harmful algal bloom, monitoring technologies for lakes and/or rivers

O6-9 RIVER LEVEL MONITORING BY CRISIS MANAGEMENT TYPE WATER LEVEL GAUGEKazuo Tsutsui¹, Kouichirou Ide¹, Tsutomu Hasegawa¹, Hiroaki Kojima²¹Hltachi, Ltd., ²OSASI Technos Inc.

There are about 20,000 rivers throughout Japan. There are many places where water level gauges are not installed in small and medium-sized rivers that account for the majority, and it is difficult to grasp the river water level in case of flooding. Since conventional water level gauges are mainly utilized in river management, the initial investment is large and restrictions are imposed on expanding the spread. For this reason, the Ministry of Land, Infrastructure and Transport set up the "Innovative River Management Project" aimed at new river management not bound by the conventional technical framework, and carried out pilot project in FY 2017. In this presentation, we outline the overview specification of the crisis management type water level gauge that was developed through participating in the project, processing of measured data, correspondence of maintenance free, and evaluation of verification test result. 5 cases of observation results of floods measured during the rainy season showed stable measurements reproducing time series information during flooding period. Among them, stable measurement with no data missing was confirmed on August 19th although there were about 1,000 lightning strikes in 2 hours. We also make some recommendations on how to utilize water level measurement data in the future. Such as provision of shelter information useful for evacuation, location display utilizing the GPS function of the smartphone, comparison with past archive information, cooperation with geographical information.

Keyword: crisis management type water level gauge, river, water level measurement, flood, cloud

O6-10 ESTIMATION OF SECCHI DISK DEPTH IN LAKE KASUMIGAURA FROM MERIS

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Secchi Disk Depth (Z_{SD}), also called transparency, is an important indicator of water quality. The manual and point-based measurement of Z_{SD} has a long history with more than 200 years. With the development of remote sensing, satellite image can provide the potential for large spatial and long time-series monitoring of Z_{SD} , which is also developing to an important way for lake environment management. In this study, MERIS images from 2003 to 2012 were employed to retrieve Z_{SD} in the Japanese turbid Lake Kasumigaura. The absorption and backscattering coefficients were firstly retrieved using two versions of quasi-analytical algorithm: QAA_V6 and QAA_turbid, and then Z_{SD} were estimated based on the new method proposed by Lee in 2015. Results were validated using in-situ Z_{SD} , the RMSE and MAPE of Z_{SD} estimated using QAA_turbid were 0.10m and 14.96% respectively, the estimated Z_{SD} using QAA_V6 showed overestimation with RMSE and MAPE of 0.65m and 97.83%. This indicated that Z_{SD} estimation using absorption and backscattering coefficients from QAA_turbid was more accurate than that from QAA_V6. Long time-series results of Z_{SD} estimated from MERIS using QAA_turbid matched the in-situ Z_{SD} well, all of them showed an increase trend from 2003 to 2012 in Lake Kasumigaura. Results in this study implied that estimation of Z_{SD} from MERIS images is a potential way for long time-series Z_{SD} monitoring in lakes.

Keyword: Secchi disk depth, remote sensing, Lake Kasumigaura

Technical Session 6: Monitoring Based on Scientific Knowledge Section 4: Monitoring Lakes by Remote Sensing**O6-11 LAKE OBSERVATION BY "SHIKISAI"**Hiroshi Murakami

Japan Aerospace Exploration Agency

Climate change observation mission GCOM-C (named "SHIKISAI") carries Second-generation GLObal Imager (SGLI) which has 19 channels from near-UV to thermal infrared wavelengths with 250-m spatial resolution and 1150-1400 km swath. "SHIKISAI" chlorophyll-a and sea-surface temperature products, which will be open to the public from Dec. 2018, have been developed originally for the off-shore ocean and coastal applications, however, they can be applicable for the lakes theoretically. Actually, SGLI observation images show we can identify spatial patterns of the water color and temperature even in lakes of 10-km² scales not only in the larger size lakes like Kasumigaura. Through collaboration with the in-situ optical characterization researches of the lakes, "Shikisai" is expected to contribute to the frequent environmental monitoring of relatively large lakes by 250-m resolution and wide swath observations.

Keyword: GCOM-C, SGLI, Remote sensing, water color, water surface temperature

O6-12 IN-SITU HYPERSPECTRAL REMOTE SENSING FOR WETLANDS CONDITION ASSESSMENT - A CASE STUDY OF AN INLAND WETLANDJk Garg, Ridhi Saluja, Satish Prasad

University School of Environment Management, GGS Indraprastha University

Worldwide, wetland ecosystems are facing natural and anthropogenic pressures resulting in deterioration of their health and resilience. Conventional methods commonly use point physico-chemical measurements to characterize and monitor the health of lakes and aquatic ecosystems. Moreover, such methods fail to provide information in spatial domain. Advances in remote sensing techniques, especially hyperspectral remote sensing, is fast emerging as a potential standalone tool for assessment of health of aquatic ecosystems. In the present study, *in-situ* hyperspectral remote sensing was employed to test its potential for condition assessment of Bhindawas lake, largest man-made wetland in the state of Haryana, India. Spectral reflectance data for wetland water column and representative macrophyte species was collected at different sampling sites within the wetland using a SVC GER Spectroradiometer (350-1050 nm) during the year 2014 and 2015. Water samples were collected for the analysis of bio-optical water quality parameters (Chl-a, TSS and Turbidity). Various spectroscopic methods (smoothing and derivative analysis) and linear regression were used to analyze the spectral data. Results have revealed that spectral reflectance data allows identification of various macrophyte species which can be further utilized for species-level mapping of macrophyte distribution within the wetland. Linear regression models were developed for estimation of bio-optical parameters in the wetland water column that can successfully replace the conventional field-based methods for wetland condition assessment.

Keyword: Wetland, Hyperspectral, Remote sensing, Spectroradiometer, Data analysis technologies and modeling

O6-13 DEVELOPMENT, PROVISION AND UTILIZATION OF THE LAKE DATASETSMasami Nemoto, Yoshinori Numata, Yasuyuki Inazawa, Yoshinori Shinomiya, Ryosuke Hayashi

Geospatial Information Authority of Japan, Ministry of Land, Infrastructure, Transport and Tourism

Geospatial Information Authority of Japan, Ministry of Land Infrastructure, Transport and Tourism started the provision of the Lake Datasets, which are downloadable for free through its website from March 1st, 2017. The Lake Datasets consist of numeric data of lake topography, substratum (sediment) and distribution of aquatic plants, and map-form image data of lakes based on the numeric data. We expect the Lake Datasets to be utilized valuable for efforts on lake environment, enabling a precise, quantitative, visual and three dimensional understanding of lakes.

Keyword: monitoring techniques of lakes and rivers (including remote sensing and GIS), the Lake Dataset, numeric data, lake image data

O6-14 LONG-TERM MONITORING OF LAKE SURFACE AREA CHANGE IN INDONESIA FROM GLOBAL SURFACE WATER DATA

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Currently, the conditions of lakes in Indonesia have changed in terms of water surface area, especially for the main lake (larger than 10 km²). A manual method to extract the water surface area for long-term monitoring requires time, is costly and requires a lot of resources. Nowadays, with the development of digital image processing, the manual method is no longer effective and efficient. In this study, Global Surface Water provided by Google Earth Engine combined with simple polygon masking was used to identify lakes larger than 10 km². Results from this study show that total water surface area has increased for inland water body in Indonesia from the year 1988 until 2015. Some because of new water body formed from the former mine sites. In the other hand, some lakes decreased their water surface area. Lake Limboto, in the north side of Sulawesi Island, decreased by 12.8 km² from 2001 until 2014. The objectives of this study are to obtain long-term monitoring water surface area for all main lakes so that it can be used to update lake information in Indonesia.

Keyword: monitoring technologies for lakes and/or rivers (including remote sensing, GIS)

Technical Session 6: Monitoring Based on Scientific Knowledge Section 5: Monitoring of Human Impacts**O6-15 MONITORING RADIO-CESIUM CONTAMINATION OF MOUNTAIN STREAM FISH AND ESTIMATING ¹³⁷Cs ACCUMULATION RATES OF THE FISH BY MARK-RECAPTURE EXPERIMENTS IN THE EVACUATION INSTRUCTION AREAS, FUKUSHIMA PREF**

Mika Tarui¹, Ryoji Nakazato¹, Takahiro Suzuki^{1,2}, Takuma Kawakami¹, Park Soeun¹, Masashi Kushii¹, Zin'ichi Karube^{1,3}, Hitone Suzuki⁴, Ken'ichi Kato⁴, Shinsuke Taketaka¹, Yuji Kuwahara¹

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⁴Murohara-Takase River Fisheries Cooperative Association

The ¹³⁷Cs concentrations of two species of mountain stream fish, masu salmon (*Oncorhynchus masou*) and white-spotted char (*Salvelinus leucomaenis*) were monitored on the four sites (Site A, B, C and D) with different air dose rate, in "difficult-to-return zone" of the Evacuation Instruction area during 2015-2018. In addition, mark-recapture experiments were carried out to estimate the ¹³⁷Cs accumulation rate of the fish in the two sites (Site A and D). The ¹³⁷Cs concentrations of both fish were significantly higher in the sites with higher air dose rates (Site C and D) than in lower sites (Site A and B). In the site with highest dose rate (Site D), the ranges of ¹³⁷Cs concentrations of both fish species during 2016 -2017 were 855-27,738 Bq/kg-wet in masu salmon and 651-18,865 Bq/kg-wet in white-spotted char, respectively. In all sites, ¹³⁷Cs concentrations of both species collected during sampling period did not decrease clearly. Therefore, ¹³⁷Cs concentrations of both species were supposed to reach equilibrium state in the present when approximately seven years passed from the nuclear accident at the Fukushima Daiichi Nuclear Power Plants. As a result of mark-recapture experiments in 2016 (experiment period: 150 days), the ¹³⁷Cs accumulation rate of masu salmon was 2.5 Bq/kg/day in Site A and 24.9 Bq/kg/day in Site D, respectively. The accumulation rate was significantly faster in Site D than Site A. In addition, the accumulation rate of white-spotted char were significantly lower than that of masu salmon.

Keyword: masu salmon, white-spotted char, forest stream, monitoring ¹³⁷Cs concentration, mark-recapture experiments

O6-16 EVALUATION OF ANTHROPOGENIC IMPACTS ON RESERVOIR WATER QUALITY: A CASE STUDY IN A RESERVOIR CATCHMENT IN SOUTHERN TAIWAN

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Recently, the need for high quality finished water has brought the land-use management around reservoir catchment area to the public attention. Human activities would damage the source water quality by different levels based on the types of activities. The objective of this study is to evaluate the impacts of anthropogenic sources on water quality around the reservoir catchment area by monitoring the occurrence of selected contaminants, including four pesticides (glyphosate, glufosinate, fenthion and thiophanate-methyl), one antibiotics (oxytetracycline) and one endocrine disrupting substance (bisphenol A) to reflect the pollution from agricultural run-off, aquaculture wastes and domestic sewage, respectively. Basic water quality parameters were also acquired to examine the relation between water qualities and the occurrence of trace organic pollutants. Samples were collected every month from March to July in 2017 near a reservoir located in southern Taiwan. Results showed bisphenol A exists ubiquitously and glyphosate concentration varies along with farmer's behavior. Glyphosate concentration was positively correlated to ammonia nitrogen and total phosphorus and inversely correlated to dissolved oxygen. As for oxytetracycline, its polluted area was not as wide as bisphenol A and glyphosate, indicating the aquaculture activities was limited in the area. Overall, this study revealed that the occurrence of selected contaminants can be surrogates to indicate human pollution.

Keyword: reservoir catchment, human activity, BPA, pesticide, OTC

O6-17 INVESTIGATION OF THE SOURCE OF E.COLI IN THE SOUTHERN PART OF LAKE BIWA

Masaru Ihara¹, Siyao Liu¹, Taichi Tamura¹, Chihyu Ma¹, Dongbum Im¹, Naoyuki Yamashita², Hiroaki Tanaka¹

¹Kyoto University, ²Ehime University

In Japan, *Escherichia coli* (*E.coli*) is now being discussed as the alternative current fecal pollution indicator, total coliforms (TC). It is believed that *E.coli* is better indicator than TC due to its specificity for fecal contamination from warm blood animals. However, how much does the *E.coli* in water environment come from human or other animals feces is not understood well. In this study, we conducted whole genome analysis of *E.coli* isolates from southern part of Lake Biwa, and influent and effluent of wastewater treatment plants (WWTPs) located there by using next-generation sequencing. Also, we analyzed whole genome sequence of ampicillin-resistant *E.coli* from southern part of Lake Biwa and WWTP effluents. Based on the sequence of whole genome from *E.coli* isolates, we conducted multi-locus sequence typing (MLST) analysis, phylogroup identification, and phylogenetic tree analysis. Microbial source tracking analysis also conducted using 13 host specific genetic markers for human, cow, pig, and chicken feces to identify the source of each *E.coli* isolate. Results in this study indicate that majority of *E.coli* in the Lake biwa was from chicken and cow, not human feces. On the other hand, sources of ampicillin-resistant *E.coli* in the Lake Biwa were both chicken and human feces.

Keyword: Lake Biwa, E. coli, Whole genome analysis, source tracking

06-18 ESTIMATION WITH TIME SPREAD OF DISSOLVED OXYGEN DEFICIENCY IN AQUATIC ENVIRONMENTS BASED ON DISSOLVED METHANE AND NITROUS OXIDE MEASUREMENTS

Yuzuru Kimochi, Hitoshi Tanaka

Center for Environmental Science in Saitama

We constructed and proposed a method to estimate the dissolved oxygen (DO) deficiency in aquatic environments with time spread ranging from hours to an entire day, with measurement of dissolved methane (DCH_4) and nitrous oxide (DN_2O). Based on the results of the water purification experiment, the determination threshold of the DO deficiency in this method was set to 0.025 mgC/L and 0.003 mgN/L for DCH_4 and DN_2O , respectively. Next, the threshold value was verified from continuous monitoring in actual ponds and data of past literature. As a result, although it may be necessary to set a value for each field, since at least detection of DCH_4 reflects the occurrence of an anaerobic environment, it can be used for screening of a detailed investigation site related to DO depletion. In this way, the most important merit of our method is that the method can be used to estimate previous DO levels especially, without the need for continuous DO monitoring. In addition, as sampling of dissolved gases by the headspace method is simple, a large number of gas samples can be collected efficiently by field survey and analyzed collectively by laboratory etc. It can be analyzed with GC-FID for CH_4 and GC-ECD for N_2O : both analytical instruments are relatively inexpensive and easy to introduce. Applying this method to similar lakes can be expected if knowledge about thresholds is accumulated and diversified in various regions, climate, lake size (breadth and depth), eutrophication level, etc.

Keyword: Dissolved oxygen (DO), Dissolved nitrous oxide (DN_2O), Dissolved methane (DCH_4), Hypoxia/anoxia, Aquatic environment monitoring

Technical Session 6: Monitoring Based on Scientific Knowledge Section 6: Monitoring of Emerging Pollutants**O6-19 SOURCE ESTIMATION OF VETERINARY DRUGS IN YODO RIVER WATERSHED, JAPAN**

Seiya Hanamoto, Norihide Nakada, Naoyuki Yamashita, Hiroaki Tanaka

Research Center for Environmental Quality Management, Graduate School of Engineering, Kyoto University

Twelve veterinary drugs were monitored at four rivers in Yodo River watershed, Japan over 17 sampling events. Among the five frequently detected veterinary drugs, mass flux in the river was significantly correlated with human population in the catchment for three veterinary drugs substantially used by humans, sulfamethoxazole, trimethoprim, and sulfadimethoxine. Sources of the three would be sewage treatment plants and household septic tanks. On the other hand, mass fluxes of the remaining two, sulfamonomethoxine and lincomycin, in the rivers showed positive correlation with swine population in the catchment, although sulfamonomethoxine is equally used in both cattle and swine farming. This was attributable to application of cattle excrement as manure, and lability of sulfamonomethoxine during composting processes. The major source of the two would be on-site treatment facilities of swine urine.

Keyword: veterinary drugs, source estimation, field study, livestock population, human population

O6-20 IMPACTS OF SEDIMENT SUPPLY FROM A DAM RESERVOIR ON HEAVY METALS CONCENTRATIONS IN DOWNSTREAM RIVER WATERYuji Suzuki¹, Hiroyuki Mano², Satomi Mizukami-Murata¹, Fumiaki Ogawa¹

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Sedimentation in a dam reservoir is one of the important issues to overcome for utilizing the reservoir over a long term. In order to solve this, in Japan, sediment supply from reservoirs to their downstream rivers has been attempted. However, there is limited knowledge on the impacts on the water quality just after the sediment supply. In this study, leaching tests of heavy metals from reservoir sediments were conducted to evaluate the occurrences of heavy metals at the downstream after sediment supply. As a result, manganese (Mn) was considered as the dominant and concerned heavy metal in the assumed case. In addition, short-term toxicity test was conducted to determine the toxicity of Mn to Japanese medaka (*Oryzias latipes*) and the No Observed Effect Concentration (NOEC) was derived as 5 mg-Mn/L. The Predicted Environmental Concentration (PEC) / the Predicted No Effect Concentration (PNEC) ratio regarding to Mn was obtained from the result of leaching tests as 0.015 which was much lower than the value (4.67) obtained from the data of Mn contents in the sediment. It was indicated that leaching from sediment is an important factor to evaluate the environmental risk of Mn to fishes just after an event of sediment supply.

Keyword: Water Quality, Chemical Substances, Sediment Supply, Heavy Metals, *Oryzias latipes*

O6-21 RECENT PROGRESS OF AN ADVANCED ECO-HYDROLOGIC AND BIOGEOCHEMICAL COUPLING MODEL IN TERRESTRIAL-AQUATIC CONTINUUM

Tadanobu Nakayama

National Institute for Environmental Studies

The author has developed process-based National Integrated Catchment-based Eco-hydrology (NICE) model to integrate coupled human and natural systems and to assess impact of water degradation on ecosystem change. Here, the author further developed an advanced model coupling eco-hydrology and biogeochemical cycle (NICE-BGC), which incorporates the whole process of carbon cycling including surface runoff, groundwater, weathering, CO₂ evasion and sediment storage in water, and outflow to the ocean. Because the new model included CO₂ evasion and lateral carbon transport explicitly, the result suggests most previous researches have generally overestimated the accumulation of terrestrial carbon and underestimated the potential for lateral transport. The model result also showed that there is a great variability of DOC, POC, and DIC transport to the ocean reflecting biologic and hydrologic processes, and CO₂ degassing affected by both terrestrially derived CO₂ and CO₂ production through aquatic metabolism.

Keyword: modeling, eco-hydrology, biogeochemical cycle, coupling model, inland water

O6-22 IMPACT OF CLIMATE CHANGE ON CHANGES IN RIVER WATER TEMPERATURE SIMULATED WITH SIPHER MODEL IN TAKASAKI RIVER BASIN, CHIBA, JAPAN

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In this research, uncertainty of the future climate change was investigated by continuous long term monitoring and validation of the simulated temperature obtained with SIPHERTM model. Model was calibrated and validated for 2012 - 2016 from water temperature collected across 8 stations in Takasaki river, Chiba, Japan. Water quality parameters namely, water temperature, water depth, and electrical conductivity were measured at every 10 minute interval with sensors. Monthly average of the observed and simulated water temperature for stations with higher pervious areas was found to be close to each other ($R^2 > 0.90$). In general, it was observed that the simulated temperature obtained with SIPHER model was less reproducible for small basin ($R^2 < 0.90$). Future metrological parameters were predicted with CNRM-CM5 general circulation model. Impact of climate change in river water was then done for the present (2000 - 2010) and future (2060 - 2070) decade. Monthly average future temperature decreased by at least - 0.2 °C in Dec-Jan-Feb-Mar, and increased by 1.2 °C in October, and at least 0.2 °C in Apr-May-Jun-July-Aug-Sep. It is confirmed that due to climate change, temperature in winter decreases whereas it increases in summer.

Keyword: monitoring system, data analysis technologies and modeling, water quality, climate change, GIS

O6-23 ASSESSMENT OF STREAM FLOW USING SOIL AND WATER ASSESSMENT TOOL (SWAT) IN LOKTAK LAKE CATCHMENT

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¹Water Management, Wetlands International South Asia, ²Conservation Programme Manager, Wetlands International South Asia

Stream flow is very important in water cycle and a useful water resource to sustain human life. However, estimation of stream flow in an ungauged catchment still poses a challenge. Hydrological models are one of the commonly used techniques for the discharge simulation in ungauged stations. This paper focusses on the estimation of stream flow in the Loktak Lake catchment (part of the Manipur river basin) using Soil and Water Assessment Tool (SWAT). SWAT, developed by the United States Department of Agriculture which analyzes the stream flow based on Digital Elevation Model (DEM), soil map, land use map and meteorological dataset. The SWAT tool was run for the year 1999-2002 on 2 gauged sub-catchments (Nambul and Iril), which are calibrated and validated using the observed discharge. Calibration was carried out using manual iterative process and the evaluation of the model was done using Nash-Sutcliffe model efficiency (NSE) coefficient. The results between observed and modelled flow showed agreement with NSE value 0.837 for Iril River and 0.837 for Nambul River. These results were used to estimate the ungauged sub-catchment flows. The results show high variation in discharge of all the rivers with high discharge during monsoon season and low in the other month of the year. The highest flow was found in Iril followed by Thoubal. This assessment can be helpful in generating the water balance of Loktak Lake

Keyword: Hydrological modelling, SWAT, Stream Flow, Ungauged, Loktak

Technical Session 6: Monitoring Based on Scientific Knowledge Section 7: Data Analysis and Modeling**O6-24 DEVELOPING A MODEL FOR ESTIMATING SECCHI DISK DEPTH USING LANDSAT TM AND ETM+ IN INDONESIAN LAKES**

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A simple data pre-processing to minimize the atmospheric effects and improve data quality was proposed to build a model for estimating Secchi Depth (SD) from Landsat TM and ETM+ data. The model intended to be simply applicable without requirement of in-situ data for both atmospheric correction and model recalibration. Rayleigh scattering effects were removed using 6S software. Median filters were applied iteratively to improve the low Signal-to-Noise Ratio. Aerosol scattering effects in visible bands were reduced using the SWIR band. The reflectance extracted from pre-processed Landsat images and corresponding in-situ SD measurements from 9 lakes collected from 2011 to 2014 (ranging from 0.5 m to 18.6 m) were used for model calibration. Other in situ SD measurements from 31 Lakes collected in 1992-1993 (ranging from 0.4 m to 20 m) were used to validate the developed model. A long-term change of SD in Lake Maninjau estimated from the model was also compared with in situ data collected from 2001-2017 for another validation. Results show that the developed model provides acceptable result and robust estimates SD for both several different lakes in 1992 and long-term change SD of Lake Maninjau with determination coefficients of 0.81 (with RMSE of 2.59 m, n=31) and 0.46 (with RMSE of 1.22 m, n=17) respectively. These results indicate that the developed model is simply applicable and has a potential to fill the SD data gap for further water environment studies.

Keyword: Secchi Depth, Water quality, Landsat, Monitoring, Lake

O6-25 RELATIONSHIP BETWEEN WATER QUALITY AND PHYTOPLANKTON SUCCESSION IN LAKE BIWA ANALYZED BASED ON THE PEG MODEL

Shohei Ikeda

Shiga Prefecture

Monitoring of Lake Biwa has been continuing for more than 30 years. From previous study, we analyzed long-term variation of phytoplankton biovolume and found that decreasing of phytoplankton and increasing in cyanobacteria. But there is not discussing about long-term changing of phytoplankton succession. In this study, we classified it from the biomass of phytoplankton taxon group using Bray-Curtis similarity. As a result, phytoplankton succession was classified into 5 patterns and changing from a eutrophic condition type to oligotrophic condition in PEG model. This tendency was consistent with the nutrient condition in Lake Biwa. So, phytoplankton succession is useful as an index to evaluate the nutrient condition in Lake Biwa.

Keyword: monitoring technologies for lakes and/or rivers

O6-26 VIRAL HOT SPOT IN LAKE BIWA, JAPAN

Shang Shen, Taketoshi Kusakabe, Yoshihisa Shimizu

Kyoto University

We investigated seasonal distributions of viruses and their hosts in Lake Biwa (depth: 90 m) to examine how distribution of viral abundance are related to their hosts abundance. Viral abundance was positively but not strongly correlated with bacterial abundance ($r = 0.47$, $n = 126$, $p < 0.01$) and Chl. *a* concentration ($r = 0.40$, $n = 126$, $p < 0.01$). Viral hot spot, where large quantities of viruses are contained, was found at the depth ranged from 20 to 40 m and related to the surface mixing layer. These data indicated that viral distribution affected by a combine effect of hosts distribution and physical processes such as vertical water mixing and UV.

Keyword: Lake Biwa, Virus, Distributuon, Surface mixing layer, Monitoring technologies for lakes and/or rivers

O6-27 COMPARISONS BETWEEN THE CHARACTERISTICS OF NATURAL ORGANIC MATTERS IN UPSTREAM INFLOWING RIVERS AND DISCHARGING SOURCES OF A DRINKING WATER RESERVOIR WITH OR WITHOUT THE TRANSBASIN DIVERSION

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¹Department of Environmental Engineering, National Cheng Kung University, ²Environmental Protection Administration, Executive Yuan, Taipei, R.O.C. (Taiwan)

The characteristics of natural organic matter (NOM) in the Agongdian Reservoir (AGD) and its inflowing rivers and discharging sources during the periods with or without transbasin diversion are compared using dissolved organic carbon (DOC) measurements and fluorescence spectroscopy methods. The fluorescence excitation-emission matrices (FEEM) method was applied to characterize the NOM into five organic groups, including type I simple aromatic protein (API), type II simple aromatic protein (APII), fulvic acid-like substances (FA), soluble microbial by-product-like material (SMP) and humic acid-like substances (HA). Although the main fractions of NOM are FA and HA during both periods, the average fluorescence intensity (AFI) of each group as well as the levels of DOC obtained during transbasin diversion are lower, indicating that the transbasin diversion water may not be a significant source of NOM. The total AFI of API, APII and SMP links well with the levels of human activities, and shows that discharging sources in the Wanglai tributary are the hotspots of NOM. Comparing to the non-transbasin-diversion period, the levels of total AFI are easier to be explained by the levels of DOC during transbasin diversion. Characterizing the distribution patterns of NOMs in a catchment area of source water provides useful information for identifying potential NOM sources.

Keyword: water quality problems and pollution concerning water use, water quality management, monitoring technologies for lakes and/or rivers

O6-28 COOPERATION FOR STUDY NON-BIODEGRADABLE ORGANIC MATTER IN THE LAKE BIWA-YODO RIVER WATERSHED

Keiko Wada, Hiroshi Tsuno

Institute of Water Environmental Research, Lake Biwa-Yodo River Water Quality Preservation Organization

We have been engaged on the problem of non-biodegradable organic matter and its countermeasure in Lake Biwa a two-decade-long study. On the other hand, each research institute in the Lake Biwa-Yodo River watershed is also proceeding for each research purpose. However, a critical issue are the insufficient past knowledge and data, because there is no the official method and it takes long time to analysis. Therefore, with the cooperation of related research institutes in the Lake Biwa-Yodo River Basin (Shiga Pref., Kyoto Pref., Osaka Pref. and Hyogo Pref.), a two-year work was carried out. It was organized the water quality situation, the influence of each watershed, and the efforts of municipalities, and they systematically has compiled the knowledge of each target water so that it will be a handbook of non-biodegradable organic matter. In particular, the method of biodegradability test was unified for accumulate scientific knowledge in the future, and was proposed the "standard biodegradability test method". It is expected that accumulation of more data will be advanced by this analytical method. Moreover, it could be made possible to understand the situation of non-biodegradable organic matter in the entire basin.

Keyword: non-biodegradable organic matter, monitoring system, cooperation for watershed, GIS

TS7-1 RESTORATION OF LOCH LEVEN: SUSTAINING ECOSYSTEM SERVICES



Brian D'arcy

Independent environmental consultant, & Partner C&D Associates LLP Co-founder consulting gateway

Loch Leven is the largest lowland lake (loch) in Scotland (13.3km²) and is relatively shallow (mean depth 3.9m) with a large surface area in relation to its catchment (Smith 1974). Historically, water quality was good at the turn of the 20th century, but deteriorated as industrial development and increases in the size of the villages and town in the catchment, resulted in phosphate rich effluents draining into the loch. A condition of hyper-eutrophication developed, with varying periods of improvement followed by slippage in quality.

The catchment of the loch is mainly mixed agricultural, with some forestry in the hills. Diffuse sources of nutrients became increasingly important as restoration efforts focused on the effluent discharges were successful, leaving diffuse pollution as the principal challenge.

Social and economic activities provided by the loch have included:

- Drainage and effluent disposal
- Nature conservation (it is a designated National Nature Reserve, and a Ramsar Wetland)
- Angling (trout)
- Bird-watching (an RSPB reserve adjoins the loch)
- Informal recreation (walking and cycling in the area)
- Hydropower generation (downstream industries fed by the loch outflow)
- Local economic benefits (lake-associated tourism, including accommodation and use of shops, cafes etc by visitors and local people too)

The deteriorating water quality adversely affected the above in varying ways explored in this paper. Ecosystem services (provisioning, regulating and cultural) have been discussed in relation to Loch Leven by May and Spears (2012), exploring the inter-related impacts of various factors and actions. This paper documents changes to community benefits since the quality of the loch improved (associated with the loch, but not necessarily due to the water quality).

The pollution and restoration history of Loch Leven has been variously described in earlier papers (D'Arcy 1991, D'Arcy et al 2006, May et al 2012). The nature and basis of the controls implemented during the recovery period is set out in this paper. That included work with the textile mill, and determining appropriate best practice discharge standards for the municipal sewage effluents. The regulatory effort included enforcement actions with various polluters in the catchment to raise awareness of the requirements for better quality in the tributary watercourses and hence the loch. That work included a focus on combined sewer overflows and pumping station discharges too. From the mid 1990s, awareness of the nature and importance of diffuse sources of pollution increased and a series of initiatives with local farmers, agricultural advisors and the River Purification Board (later SEPA) led to the establishment of a suite of diffuse pollution controls (D'Arcy and Frost 2003). Creativity in finding means to fund measures such as buffer strips and reduced nutrient additions was a feature of effective work during that period. (References given in full in the full paper).

Keyword: Lake restoration, phosphorus, pesticides, BMPs, environmental regulation, ecosystem services

Curriculum Vitae

Academic qualifications:

PhD (2013), *The Development of a Strategic Approach to Managing Diffuse Pollution*, University of Abertay Dundee, UK

MSc (1981) Salford University, UK (by research, part-time: *Biological indicators of heavy metal pollution*).

BSc (hons) Biology, (1974) Queen Mary College of London University, UK

Professional positions:

MEMBER, CHARTERED INSTITUTE OF WATER & ENVIRONMENTAL MANAGEMENT (CIWEM).

MEMBER INTERNATIONAL WATER ASSOCIATION

Employment record:

2010-present - Self employed environmental consultant, and 2013-2015 Research Fellow at Abertay University

1996-2010 - various, in later years Diffuse pollution project manager, Scottish Environment Protection Agency

1985-1996 - Pollution Prevention officer, then Catchment Planner, Forth River Purification Board

1975-85 - North West Water Authority (pollution prevention roles and part-time biologist, Mersey Estuary)

1974-75 - Lancashire River Unit of NWWA; asst pollution prevention officer.

Research summary:

From earliest days of career, in English Lake District, focus has been on water quality improvements, and how to achieve them. Intermediate career years working as a catchment planner for the varied catchment of the River Forth in Scotland highlighted sector and community engagement as vital elements in any plan to improve water quality. Since 1996 working on diffuse pollution has been a primary focus. Lead author of 3 books:

D'Arcy BJ, Kim L-H and Maniquiz-Redillas M (2018) *Wealth Creation Without Pollution - Designing for industry, ecobusiness parks and industrial estates*, IWAP, London.

Campbell N, D'Arcy B, Frost A, Novotny V and Sansom A (2004) *Diffuse pollution: an introduction to the problems and solutions*. IWA Publishing, London. ISBN: 1 900222 53 1.

D'Arcy BJ, Ellis JB, Ferrier RC, Jenkins A and Dils R (2000). *Diffuse pollution Impacts: The Environmental and Economic Impacts of Diffuse pollution*. Chartered Institution of Water and Environmental Management, London. ISBN: 1 870752 46 5

Published many papers and magazine articles, including more 15 in refereed journals. Edited 3 sets of conference proceedings.

Some selected papers for this topic include:

D'Arcy BJ (2015) A catchment scale approach to managing diffuse pollution. *Water* 21, June 2015, pp 26-28, IWAP.

D'Arcy BJ (2012) Catchment management for Loch Leven. *FWR Newsletter* Issue 1, p.6, 2012, Foundation for Water Research, water framework directive information centre, www.euwfd.com

D'Arcy BJ (2008). Loch Leven Restoration - A Partnership Approach. *FWAG Scotland*, Issue 8, p 11, Perth

D'Arcy BJ, May L, Long J, Fozzard IR, Greig S and Brachet A (2006) The Restoration of Loch Leven, Scotland UK, *Water Science & Technology* 53 (10): 183-191

D'Arcy BJ and Frost (2001) The role of best management practices in alleviating water quality problems associated with diffuse pollution. *The Science of the Total Environment*, 265 (2001) 359-367. Elsevier.

D'Arcy BJ (ed.)(1993). *Loch Leven: The Report of the Loch Leven Area Management Advisory Group*, LLAMAG technical report, from Forth River Purification Board, Edinburgh (available from SEPA Edinburgh)

D'Arcy BJ (1991) Legislation and control of dye-house pollution. *Journal of the Society of Dyers and Colourists* 107: 387-389

Awards include the IWPC Largest Award (industrial estates), Green Apple Award (SUDS), VIBES Award in 2015, (raingardens), and Innovate UK's Glasgow Challenge at the ECCA conference in Glasgow in June 2017 (raingardens).



TS7-2 A PERSPECTIVE ON WATER ENVIRONMENT MANAGEMENT IN JAPANESE LAKES



Mitsumasa Okada

The Open University of Japan

The management of water environment in Japanese lakes and reservoirs started in 1970's by the environmental water quality standard such as COD_{Mn} to prevent serious problems in water uses caused by organic pollution. Effluent regulations were also started by the Water Pollution Prevention Act to satisfy with the standard. However, percent compliance of the environmental water quality standard on COD_{Mn} did not improve and various problems associated with eutrophication were reported. Additional environmental water quality standards and related effluent regulations both for nitrogen and phosphorus started in 1982 to cope with eutrophication. Also, the Law Concerning Special Measures for Conservation of Lake Water Quality (1984) was enacted to control non-point sources, regulate total loading of pollutants and protect lakeshore ecotone vegetation. However, only a half of lakes and reservoirs could satisfy with the environmental water quality standards even in 50 years. Also, COD_{Mn} increased in some lakes irrespective of the reduction of loadings. The new environmental water quality standards on benthic dissolved oxygen concentration and littoral zone transparency were enacted as new targets of comprehensive water environment management. Also, adaption to climate change is a new challenge in Japanese lakes and reservoirs.

Curriculum Vitae

Researcher, in National Institute for Environmental Studies, Environment Agency
 Visiting Scientist, Corvallis Environmental Research Laboratory, U.S. Environmental Protection Agency
 Dean, Graduate School of Engineering and School of Engineering, Hiroshima University
 Executive Vice President, Hiroshima University
 Professor, Open University of Japan
 Executive Vice President, Open University of Japan

O7-1 THE WATER QUALITY OF LAKE KASUMIGAURA AS WATER SOURCE

Maki Asami, Marie Shimada, Takayuki Ishizaki, Mutsuo Ito

Ibaraki Prefectural Public Enterprise Bureau

Lake Kasumigaura is important water source for Ibaraki Prefectural Public Enterprise Bureau. However, organic matter and musty odor in the lake tend to be more than other sources, so it is a serious problem to be reduce these substances. We have carried out water quality survey of Lake Kasumigaura for 22 years, and divided the data into 4 phases and analyzed. It was found that the dissolved organic carbon tended to increase in summer in each phase and decrease as the phase changed. In addition, a unique tendency was observed that the musty odor in Lake Kasumigaura occurred at high concentrations from winter to spring. Also, one of them, geosmin, was found to be positively correlated with turbidity, which suggested the possibility of occurrence prediction. Overall, the water quality of the lake have shown better trend than the worst phase in recent years. However, since the concentrations of organic matter and musty odor tend to be still higher than other sources, we will continue this survey and to observe the water quality of Lake Kasumigaura carefully.

Keyword: water and wastewater treatment technology

O7-2 DEMONSTRATION FACILITY FOR PURIFICATION OF LAKE KASUMIGAURA ADOPTING FLOCCULATION AND MAGNETIC SEPARATION SYSTEM

Hideyuki Watanabe, Norio Asada, Kiyoshi Kikuchi, Takuya Nakagi

Hitachi, Ltd.

The Purification Facility of Lake Kasumigaura is a demonstration plant which aims to remove suspended solids (SS) and phosphorous from lake water. The technology adopted is a Flocculation and Magnetic Separation System (hereafter FMS) which combines elemental technology of "flocculation" and "magnetic separation". The FMS can effectively remove SS and phosphorous from raw water in a short retention time. Accordingly the treatment retention time is 2 minutes and 40 seconds; that is, reduced to one thirtieth (1/30) as compared with a conventional solid-liquid separation. The design capacity of the demonstration plant is 10,000m³/d. The raw water intake is in a closed water area of Lake Kasumigaura, from where it is taken into the facility, SS and phosphorous are removed, and the treated water is returned to the Lake. The demonstration test was implemented from 2013 to 2017, during which the treated water generally achieved the target water quality (SS : less than 5mg/L, Total-phosphorous : 0.03mg/L) throughout the test period.

Keyword: in-lake restoration, water purification and wastewater treatment

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services Section 2: Ecosystem Service**O7-3 VALUE-CHAIN ANALYSIS - AN ASSESSMENT APPROACH TO ESTIMATE LAKE NASSER FISHERIES PERFORMANCE**Ahmed Mohamed Nasr-Allah

WorldFish

Although, the fishery in Lake Nasser has existed for more than 40 years, the economic and financial performance of its fisheries-based businesses not well understood. The current study aimed to improve understanding of fisheries value chain performance in Lake Nasser. Individual interviews and focus group discussions with fishers, traders, and processors were used to collect quantitative and qualitative information about financial performance, employment creation and critical factors impacting performance of each node throughout the chain.

Tilapias account for 75%, while pebbly fish and tigerfish account for 13% of capture. Fish processing is an important subsector as some fish species (mainly tigerfish and pebbly fish) are only consumed after going through a salting process. Fishers obtained a relatively low percentage (49%) of the final consumer price. Average catch per fisher per day was 20 kg and average total cost in the three fishing harbours was EGP 5210/t. One hundred tons of fish caught and sold provides an average 29.99 Full-Time equivalent jobs (FTE).

The current study suggests that the fishery is under pressure from overfishing. Critical factors facing the fisheries sector and impacting profitability are numerous. This value chain study improve our understanding of the performance of fisheries sector in Lake Nasser and identified limiting factors and action needed to support fisheries development in the Lake.

Keyword: Fisheries, Lake Nasser, Value chain, Tilapia, Pebbly fish

O7-4 CONSERVATION FOR LAKE ECOSYSTEM THROUGH SUSTAINABLE UTILIZATION OF AQUATIC WEEDSSyuhei Ban¹, Tatsuki Toda², Mitsuhiko Koyama^{2,5}, Kanako Ishikawa³, Ayato Kohzu⁴, Akio Imai⁴

¹University of Shiga Prefecture, ²Soka University, ³Lake Biwa Environmental Research Institute, ⁴National Institute for Environmental Studies, ⁵Tokyo Institute of Technology

There are many problems related to overgrowth of aquatic weeds in many lakes and rivers throughout the world. In Japan, the costs for harvesting are increasing year to year by 200 million Japanese yens (equivalent to 1.8 million USD) a year in Lake Biwa. Historically, aquatic weeds were harvested for use as fertilizer in agriculture in Japan, but are no longer used now, because chemical fertilizers more effectively promote plant growth, and are easier and cheaper to use than the macrophytes. Thus, developing effective ways of utilizing aquatic macrophytes is important for resolving this issue. In addition, sustainably harvesting the aquatic weeds is also important for lake ecosystem management, because aquatic weeds play a key role in lake ecosystems as nursery grounds and refuges for other small organisms living in the littoral area. Therefore, management and effective utilization of aquatic weeds through sustainable harvesting may play an important role in the conservation of lake ecosystems. In this presentation, a recycling system using anaerobic digestion (AD) of submerged macrophytes, which were sustainably harvested from lakes, and micro-algal mass culturing with the AD effluent was introduced as a new technique for the conservation of lake ecosystems.

Keyword: aquatic weeds, sustainable utilization, 'Sato-umi' recycle-oriented society, anaerobic digestion, micro-algal culturing

O7-5 ASSESSMENT OF THE FRESH WATER ECOSYSTEM SERVICES OF RESERVOIRS/HPP DAMS IN THE KURA-ARAS RIVER BASINRovshan K Abbasov

Environmental Research Centre, Khazar University

This study focuses on freshwater ecosystem services that support hydropower plants (HPP)/dams development in the Kura-Aras River Basin in Azerbaijan. The study assesses the HPP/dams sector, and reviews additional sectors including nature-based tourism, irrigated agriculture, and drinkable water supply. In addition, the study briefly discusses the role and value of ES that help to mitigate natural hazards related to poor ecosystems management.

The study used a basic Targeted Scenario Analysis (TSA) approach. The TSA assesses current "business as usual (BAU)" ecosystems management practices and its current value of ecosystems services under BAU. It uses sector output indicators and compares with potential "sustainable ecosystems management (SEM)" outputs to assess losses and potential gains (or losses) of shifting from BAU to SEM. The BAU approach is characterized by a focus on short-term gains (e.g., < 10 years), externalization of impacts and their costs, and little or no recognition of the economic value of ES, which are typically depleted or degraded. Under SEM, the focus is on long-term gains (> 10 years); also under SEM, the costs of impacts are internalized. Ecosystem services are maintained, thus generating potential for a long-term flow of ecosystem goods and services that can enter into decision making. SEM practices tend to support ecosystem sustainability as a practical and cost-effective way to realize long-run profits.

Keyword: water quality, pollution, ecosystem services, sustainable ecosystem management, business as usual

O7-6 CLIMATE CHANGE IMPACT ASSESSMENT ON ECOSYSTEM SERVICES OF WEST LAKE, HANOI CAPITAL AND SUGGETION A SYSTEM OF MITIGATION AND ADAPTATION MEASURES

Mai Huong Doan

Department of Ecology, Faculty of Biology, VNU Hanoi University of Science

West Lake is the freshwater lake in the Red River Delta in Vietnam, located in Hanoi capital. The lake is one of the few natural freshwater largest lake in the country. West Lake is listed as one of the lakes to be preserved in the world. Due to this such important role of lake, this research has analyzed current status of natural and socio-economic conditions of the West Lake, Hanoi capital and surrounding areas. From there, assess the ecosystem services that the West Lake ecosystem brings. There are four ecosystem services groups of West Lake: provisioning services, regulating services, supporting services and cultural services, in which the group of cultural services is crucial. By analyzing climate change scenarios of Vietnam in general, climate change scenarios of Hanoi capital in particular to assess the impacts of climate change on each group of ecosystem services of West Lake. From that point of view, proposals will be made to mitigate and adapt to climate change impacts for conservation and sustainable development of lake ecosystem services. A system of mitigation and adaptation actions has been proposed to restore West Lake as natural wetland as previous time for strengthening the resilience of West Lake to climate change.

Keyword: climate change, ecosystem services, mitigation, West Lake, Hanoi capital

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services Section 3: Ecotoxicity

O7-7 WHICH OF ZEBRAFISH OR JAPANESE MEDAKA IS SUITABLE FOR THE WET TEST FOR THE EVALUATION OF SEWAGE EFFLUENT?

Satomi Mizukami Murata, Yukihiro Fujimura, Tomokazu Kitamura, Keita Hattori, Fumiaki Ogawa

Public Works Research Institute

To establish the whole effluent toxicity (WET) test specific to evaluation of sewage effluent, we examined the sensitivities of Zebrafish (*Danio rerio*) and Japanese medaka (*Oryzias latipes*). In the test of sensitivities to three chemicals (nickel chloride, ammonium chloride, and sodium hypochlorite), differences of NOEC values by these two fishes were the extents of 0.5-2 fold. These results showed that the sensitivities to chemicals were similar in *D. rerio* and *O. latipes*. In the WET test for the sewage effluent, NOEC values of the influent were the same (40%) as *D. rerio* and *O. latipes*. The NOEC value was over 80% in the test of second effluent using *D. rerio*. On the other hand, the NOEC value of secondary effluent could not be obtained from the test by *O. latipes*, because surface of eggs allowed microorganisms to grow in water samples diluted in 20 and 40%. From these reasons, *D. rerio* is recommended to be used to evaluate wastewater in the WET assay.

Keyword: Whole Effluent Toxicity (WET), Zebrafish (*Danio rerio*), Japanese medaka (*Oryzias latipes*), Sewage treated water

O7-8 EFFECTS OF SEDIMENT AND WATER QUALITY ON ANTIOXIDANT RESPONSE OF BRACKISH BIVALVE CORBICULA JAPONICAPreeti Pokhrel¹, Hiroki Machida², Masafumi Fujita²

¹Major in Social Infrastructure System Science, Ibaraki University, ²Department of Civil, Architectural and Environmental Engineering, Ibaraki University

This paper deals with field experiments conducted in actual brackish environment (Hinuma lake/river and Naka river) to investigate the effects of sediment and water quality on antioxidant capacity of *Corbicula japonica*. For sediment experiments, clams were cultivated on sediments with adjusted contents of clay/silt (3.7, 20.2 and 33.1%). For water quality experiments, clams were placed in water of totally five sites. It is observed that sediment with clay/silt content of 33.1% decreased in oxygen radical absorbance capacity (ORAC) within two weeks, while sediments with those of 3.7 and 20.2% had no changes. The results indicate that the effects of sediment with up to ~20% of clay/silt content can be neglected on ORAC assay. On the other hand, Naka river had a large variation in salinity, which was different salinity condition to Hinuma lake/river. ORAC assay showed that there were significant differences between Naka River and Hinuma River ($p < 0.05$). To estimate the water quality parameters that affect ORAC, multiple regression analysis was carried out. The results revealed that ORAC values were affected by variations in salinity and turbidity. In particular, variations in the two parameters during the past two days determined ORAC of brackish bivalve *C. japonica*.

Keyword: Non-structural measures, *C. japonica*, ORAC, Clay/Silt, Salinity

O7-9 THE EFFECTS OF NATURAL AND ANTHROPOGENIC WATER QUALITY FACTORS ON SCOPE FOR GROWTH OF BRACKISH WATER BIVALVE CORBICULA JAPONICASayaka Mashiko^{1,2}, Qingxu Wu¹, Preeti Pokhrel¹, Masafumi Fujita¹

¹Ibaraki University, ²IDEA Consultants, Inc.

To assess water environment from the viewpoints of conservation of aquatic organisms, biomarkers such as an antioxidant capacity have been studied so far. However, interpretation of the indices values is difficult because of biochemical-level responses. Therefore, it is important to clarify the relationship between the biomarker responses and individual-level responses such as the growth of organisms. In this study, we developed a simple and modified method of scope for growth (SFG) for brackish water bivalve *Corbicula Japonica* based on carbon mass balance. Applying this method to clams exposed to natural water quality factors (suspended solids, water temperature and salinity) and anthropogenic water quality factor (municipal wastewater), the responses of SFG were investigated. Additionally, the relationship to the responses of oxygen radical absorbance capacity (ORAC) were assessed. Totally 16 experiments with changing the natural and anthropogenic water quality factors showed that a single effect of municipal wastewater (five times dilution) and those of two-factor interaction between municipal wastewater (five times dilution) and salinity were identified ($p < 0.05$). Negative correlation was found between SFG and ORAC under exposure of natural water quality factors ($p < 0.05$). On the other hand, no clear correlation was observed when adding municipal wastewater as an anthropogenic factor ($p > 0.05$). The clarification of the mechanism is next issue to understand the phenomena. From the findings, we conclude that SFG is useful to interpret the responses of antioxidant capacity in *Corbicula Japonica*.

Keyword: non-structural measures, brackish bivalve, scope for growth, antioxidant capacity, municipal wastewater

O7-10 SEDIMENTATION TREATMENT OF BLUE-GREEN ALGAE BY EXTRACT FROM STEELMAKING SLAG

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Improvement of the eutrophication phenomena in a enclosed water area is desired. Eutrophication phenomena cause impaired scenery. This study was conducted for evaluating effect of several types of extract from steelmaking slag on sedimentation of *Microcystis aeruginosa*, which is blue-green algae. At the same time, we examined the minimum effective dose of the extract from steelmaking slag. In addition, *Daphnia magna* was used in an immobilization test to evaluate influence on zooplankton by cationic elements from the acid extraction. As a result, sedimentation of algae was observed by some extracts from steelmaking slag. The large effect on sedimentation of algae was obtained when 0.8ml of acid extraction from steelmaking slag. As a result of immobilization test, *Daphnia magna* was suffered from a negative effect by acid extract from steelmaking slag. From these results, we concluded that this studies cleared that extract from steelmaking slag have blue-green algae sedimentation effect. However, the method is not applicable in actual water areas because of toxic for zooplankton at present. Decrease of the poisonous effect by acid extract from steelmaking slag is necessary for applying in actual water areas.

Keyword: steelmaking slag, *Microcystis aeruginosa*, *Daphnia magna*, acid extraction, immobilization test

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services Section 4: Water Treatment

O7-11 DEMONSTRATION EXPERIMENT OF NEW WATER TREATMENT SYSTEM BY TAKING LAKE KASUMIGAURA WATER(I) - EXAMINATION OF CHARACTERISTICS OF ADVANCED OXIDATION PROCESS AND ITS PERFORMANCE INDICATORS -

Shunsuke Takaya¹, Nobuhito Ouchi², Takayuki Ishizaki¹, Koichi Mashiko¹, Mutsuo Ito¹

¹Ibaraki Public Enterprise Bureau, ²(Public Interest Incorporated Foundation)Ibarakiken Kigyou Kousha

Ibaraki Prefectural Public Enterprise Bureau conducts a water supply project at 10 water purification plants, of which 6 water purification plants take Lake Kasumigaura water. Kasumigaura has been in a situation where eutrophication has progressed since the 1960's and organic matter concentration is high. So at the water purification plants with Kasumigaura as water source, countermeasures against trihalomethanes in summer and musty odor occurring from winter to spring are major issues. Therefore, the authorities conducted collaborative research with private enterprises from 2009 to 2011, and as a result judged that the treatment with the magnetic ion exchange resin and the advanced oxidation process are effective for the purification treatment with Kasumigaura as water source. Based on this result, we have constructed an experimental plant combining these treatments at the Kasumigaura water purification plant and been working on demonstration experiments from December 2014. In this paper, we report on the effect of this system on water treatment of Kasumigaura water obtained by this experiment, especially the characteristic of advanced oxidation process.

Keyword: water and waste water treatment technology

O7-12 DEMONSTRATION EXPERIMENT OF NEW WATER TREATMENT SYSTEM BY TAKING LAKE KASUMIGAURA WATER(II) -EXAMINATION OF CHARACTERISTICS OF MAGNETIC ION EXCHANGE RESIN-

Masahiko Shiba¹, Shunsuke Takaya¹, Nobuhito Ouchi², Nami Hayashi¹, Mutsuo Itou¹

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Ibaraki Prefectural Public Enterprise Bureau conducts a water supply project at 10 water purification plants, of which 6 water purification plants take Lake Kasumigaura water. Kasumigaura has been in a situation where eutrophication has progressed since the 1960's and organic matter concentration is high. So at the water purification plants with Kasumigaura as water source, countermeasures against trihalomethanes in summer and musty odor occurring from winter to spring are major issues. Therefore, the authorities conducted collaborative research with private enterprises from 2009 to 2011, and as a result judged that the treatment with the magnetic ion exchange resin and the advanced oxidation process are effective for the purification treatment with Kasumigaura as water source. Based on this result, we have constructed an experimental plant combining these treatments at the Kasumigaura water purification plant and been working on demonstration experiments from December 2014. In this paper, we report on the effect of this system on water treatment of Kasumigaura water obtained by this experiment, especially the characteristics of magnetic ion exchange resin.

Keyword: water and waste water treatment technology

O7-13 DEVELOPMENT OF THE ADVANCED ON-LINE UF DIFFERENTIAL PRESSURE PREDICTION SYSTEM

Kazuki Hagawa

Toray Industries, Inc. Water Treatment Technical Dept.

UF (ultrafiltration) membrane has been widely applied in worldwide for not only drinking water production but also waste water treatment and pre-treatment of seawater desalination. The operation and maintenance of the membrane filtration system is relatively easier than existing water treatment technologies, but know-how and experience of experts are necessary to realize appropriate operation management following with changing raw water quality and environment from hour to hour. Therefore, on-line monitoring operation system was developed with integration of UF simulation technology to achieve quantitative prediction of TMP (Trans Membrane Pressure) trends during the operation of UF membrane system with changing raw water and environmental conditions. The major advantages of this system are as follows. (1) It is possible (a) to control product water management for the water production stop during CIP (cleaning in place), (b) to arrange and prepare operators and chemicals in advance. (2) Chemical deterioration of membrane due to excessive CIP is avoidable by ensuring the appropriate timing and CIP condition based on quantified prediction. (3) Deterioration of UF membrane performance due to CIP delay is also avoidable.

Keyword: water purification and wastewater treatment, appropriate technologies for developing regions

O7-14 PROCESS, ORGANIZATIONAL, AND OPERATIONAL DEVELOPMENTS IN PUTATAN WATER TREATMENT PLANT 1 FROM 2015 TO 2017

Guia Publico, Sherwin Bacanto, Aaron S. Cornista, Greg Antonio

Maynilad Water Services, Inc.

Putatan Water Treatment Plant 1 (PWTP 1) is vital in Maynilad's aim of providing new water sources to the south of Metro Manila's West Concessionaire Zone. The plant obtains its waters from the brackish Laguna Lake, which has a turbidity of 100-200 NTU and a seasonal taste and odor problem, among others. The plant has a design capacity of 150 million liters per day (MLD) at the end of 2015, but it only reached and exceeded this nameplate capacity by the middle of 2017. The challenges in lake water quality, as well as other difficulties, were addressed by these five general aspects: (1) inculcating the safety culture in the plant such as implementation of self-evaluation of the safety of the personnel's tasks, (2) improvement of process streams such as the inclusion of biological aerated filters (BAF) to address ammonia, (3) re-organization of personnel such as the addition of the technical wing, (4) maintenance schedules, which cater to the production demand, and (5) changes in operational philosophies, especially in cleaning of ultrafiltration (UF) membranes. These developments have increased the total treated water to the reservoir by a 36% difference from the 2015 to the 2017 yearly average, which means more water is provided to the community.

Keyword: water purification, water quality and pollution concerning water use, wise use and development of water resources

07-15 CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF FROM THE NAINITAL LAKE CATCHMENT IN THE HIMALAYAN REGION OF INDIA

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Stormwater runoffs are one of the primary causes for deteriorating water quality in the Nainital Lake, a lake of national importance in Himalayan region of India. The Nainital lake is a prominent tourist attraction and the sole drinking water source for the habitants of Nainital city. The aim of this study is to investigate the characteristics of pollutants of Lake's catchment area and performance assessment of Ballasted Sand Flocculation (BSF) technology during monsoon season of year 2017. A 1 MLD capacity pilot plant was installed (land space: 54 sq.m.) and applied for treatment of stormwater runoffs from Nainital Lake's catchment. A conventional treatment method would require large land footprint, which is a big constraint in the Nainital because of hilly region. The water quality results showed marked variation during different storms especially for TSS, TP, COD, FC, Cu, Pb and Zn with maximum concentration of 864 mg/l, 1.2 mg/l, 388 mg/l, 14×10^4 MPN/100 ml, 73 µg/l, 83 µg/l and 890 µg/l respectively. The performance analyses result of the pilot plant revealed that the contaminants including trace metals in the stormwater runoff were reduced appreciably. The removal efficiency of Turbidity, TSS, Total Phosphorous, COD, FC, Cu, Pb and Zn are 86-96%, 69-93%, 75-95%, 41-82%, 61-96%, 40-82%, 56-87% and 51-77% respectively. The performance analysis results of BSF system have been found to be a promising technology for treatment of storm runoff.

Keyword: Stormwater runoff characterization, runoff treatment, ballasted sand flocculation, Nainital lake

07-16 FIELD EXPERIMENTS ON RUNOFF REDUCTION USING TERRESTRIAL ALGA AS TOPSOIL NUTRIENT ABSORBER

Katsunori Aizawa

Institute for Clean Earth

Nutrient runoff into aquatic systems leads to eutrophication. The Institute for Clean Earth developed a new technology using terrestrial microalga (a drought-tolerant cyanobacterium *Nostoc* sp.) that could reduce the amount of nutrients in surface runoff. The field-scale experiments examined whether the technology would reduce the water-soluble nutrients in the topsoils in water's edges. The experimental approach consisted of the following: assessment of the topsoil nutrient runoff risk, application of the technology, and evaluation of the efficacy. For the assessment, the topsoils were collected from various types of water's edges. Unexpectedly, most unfertilized topsoils around lakes (Biwa-ko, Imba-numa and Kasumiga-ura) and in planting beds, contained high amounts of water-soluble inorganic nutrients: above 1.2 kg N/ha and above 0.2 kg P/ha. Algal inoculated plots and the control (plots without algal inoculation) were used in the application experiments. The reduction values of N and P amounts in the topsoils were estimated to be from 1.3 to 5.4 kg N/ha, and 0.4 to 1.6 kg P/ha. Judged these values from the published information, the results suggest that the algal inoculation onto the topsoil is a promising technology for reducing water-soluble inorganic N and P in surface runoff.

Keyword: control of point and non-point source pollution, nitrogen and phosphorus cycle, nutrient dynamics

07-17 FULL-SCALE DEMONSTRATION OF NITRIFICATION CONTROL FOR ENERGY SAVING WITH SUFFICIENT WATER QUALITY

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¹Hitachi, Ltd., ²Ibaraki Prefectural Government, ³Ibaraki Prefectural Basin Sewerage Office, ⁴National Institute for Land and Infrastructure Management

This paper describes a nitrification control system using ammonium sensors and its full-scale demonstration in a municipal wastewater treatment plant. The control system aims at energy saving with a sufficient effluent quality by coupling of feedforward and feedback control. In the demonstration, the system satisfied a permitted level of ammonium in the effluent (1.0 mg/L). Moreover, compared with conventional dissolved oxygen control, the system achieved the almost same or higher removal of BOD, total nitrogen and phosphorus, and reduced the air flow volume by 16.9%.

Keyword: Nitrification control, Ammonium sensor, ICT

07-18 EXAMINATION OF THE AERATION PROCESS TO IMPROVE NITROGEN REMOVAL DURING SEWAGE TREATMENT

Masashi Soda, Yoshiyuki Ishiwatari, Kazuto Tsuda, Tomoko Sakurai, Hiromi Kobayashi

Ibaraki Prefectural Regional Sewerage Office

Itako Sewage Treatment Center in Ibaraki Prefecture, Japan, discharges treated water into Lake Kasumigaura Basin. To reduce the nitrogen load on Lake Kasumigaura, we examined improvement of nitrogen removal rate during sewage treatment in which activated sludge is used. We changed the treatment flow in the reaction tank that was divided into six sections tanks from anaerobic-anoxic-anoxic-aerobic-aerobic to anaerobic-anoxic-aerobic-anoxic-aerobic-aerobic (upstream to downstream). By changing the third tank to an aerobic tank, we promoted nitrification in the third tank and denitrification in the fourth tank. The results confirmed that nitrogen was removed as nitrate nitrogen generated in the third tank, which was subsequently denitrified in the fourth tank. In addition, denitrification was observed in the third tank, which was aerobic. The amount of nitrogen removed by the aerobic third tank was higher than that by the anoxic fourth tank. Denitrification in the aerobic tanks is due to simultaneous nitrification-denitrification under low dissolved oxygen (DO) conditions. Optimization of DO that takes simultaneous nitrification-denitrification in the aerobic tanks into consideration, in addition to denitrification in the anoxic tanks, would probably further improve the nitrogen removal rate.

Keyword: Water Purification / Wastewater Treatment Technology, Lake Kasumigaura, Sewer, Nitrogen removal, Simultaneous Nitrification-Denitrification

07-19 REALIZATION OF PARTIAL NITRITATION FOR MAINSTREAM DEAMMONIFICATION

Shoko Miyamae, Yuya Kimura, Shinichi Yoshikawa

Hitachi, Ltd.

Performance of novel nitrification process using gel entrapment carrier for municipal waste water treatment (mainstream anammox with gel-carrier) was investigated. Purpose of the study was to assess the stability of this process under low ammonium concentration (40 mg-N/L) and low water temperature (20 degrees C) condition. We applied heat-shock treatment to some portion of the nitrification gel carrier frequently for suppressing nitrite-oxidizing bacteria (NOB), and as a result, we succeeded to operate the process stably more than 3 months with suppression of the activity of NOB. In addition, it was confirmed that half-nitrification is possible at a high rate of HRT 1 hour, and that the concentration ratio of ammonium and nitrite can be maintained optimally by DO control.

Keyword: Water treatment technology, nitrogen removal, sewage treatment

O7-20 SIMULTANEOUS REMOVAL OF NITROGEN AND PRIORITY PHTHALATES FROM MUNICIPAL WASTEWATER FOR MANAGEMENT OF FRESH WATER SOURCES

Khalid Muzamil Gani, Absar Ahmad Kazmi

Indian Institute of Technology Roorkee

The study was focused on pilot scale experiments in order to understand the impact of carbon removal and nitrogen removal configuration on phthalate removal in an integrated fixed film activated sludge (IFAS) system which can be used to save lakes and fresh water sources from pollution. To achieve these objectives, four priority phthalates (DEP, DBP, BBP and DEHP) were chosen. Run I was carbon removal process and run II was nitrogen removal process. It was observed that during run I when there was intensive carbon removal process, the percentage removal was in the range of 40 - 78% (DEP), 64 - 85% (DBP), 40 - 98% (BBP) and 65 - 90% (DEHP) respectively. Comparatively to run I, the percentage removal in run II, the percentage removal of phthalates varied over a smaller range. The range of percentage removal in run II increased to 84 - 96% (DEP), 83 - 97% (DBP), 85 - 99% (BBP) and 87 - 95% (DEHP). During run I, there were fluctuations in the removal of DEP, DBP and BBP with average removal of $60 \pm 13\%$, $75 \pm 8\%$ and $76 \pm 21\%$ respectively. During run II, when the anoxic zone was developed with inlet diversion, the removal of all four phthalates was steady and higher. The maximum contribution to the overall removal was observed in the secondary oxidic tank in both operational runs. Biodegradation was observed a main contributor to the overall removal. Mass balance calculations showed that during run I, 62% of influent DEP, 65% of influent DBP, 68% of influent BBP and 61% of influent DEHP was removed by biodegradation while as during run II, 90% of influent DEP, 90% of influent DBP, 91% of influent BBP and 89% of influent DEHP was removed by biodegradation.

Keyword: Lakes, Nitrogen, Wastewater, Phthalates

O7-21 COMPARISON OF EFFLUENTS CHARACTERISTICS FROM FULL-SCALE WASTEWATER TREATMENT PLANTS IN THAILAND, USA, AND JAPAN BEFORE DISCHARGING TO LAKESPongsak Lek Noophan³, Supaporn Phanwilai³, Tamao Kasahara¹, Junko Munakata Marr², Linda A. Figueroa²¹Laboratory of Ecohydrology, Division of Forest Sciences, Department of Agro-environmental Sciences, Kyushu University, Fukuoka, Japan, ²Engineering Research Center (ERC) for Re-inventing the Nation's Urban Water Infrastructure (ReNUWit) and Civil and Environmental Engineering Department, Colorado School of Mines, Golden, CO, U.S.A, ³Department of Environmental Engineering, Faculty of Engineering, Kasetsart University, Bangkok

Three full-scale systems wastewater treatment plants (WWTPs) from Thailand, United States of America (USA), and Japan were used as study sites. All of these WWTPs were designed and operated for biological nitrogen removal (BNR) by using nitrification-denitrification processes. In general, the WWTPs in Thailand operated at higher values of temperature, HRT and SRT comparison to USA and Japanese WWTPs. Influent and effluents from these sites are compared and discussed in terms of BNR, dominant nitrifying and ammonia oxidizing archaea (AOA) microorganisms, and WWTP engineering design. Polymerase chain reaction coupled with denaturing gradient gel electrophoresis was used to identify dominant bacteria involved in nitrogen transformations: ammonia-oxidizing bacteria (AOB), nitrite-oxidizing bacteria (NOB), and nitrate reducing bacteria (NRB). AOB *Nitrosomonas* sp. was found only in Thailand where aerobic HRT was 4 hours and SRT was higher than 15 days. Furthermore, AOB *Nitrosospira* sp. were found only in Japan at aerobic HRT lower than 4 hours and SRT higher than 13. NOB *Nitrospira* sp. was found at aerobic HRT higher than 4 hours and SRT higher than 6 days. Interestingly, *Nitrotoga* sp. was found in the aerobic tank one in Thailand and one in Japan and co-occurred with NRB *Burkholderia denitrificans*. The higher wastewater temperature and lower influent nitrogen concentration in Thailand appear to promote a different AOB and NOB community structure than in Japan. The conditions at the Thai WWTP promoted the dominance of AOA *amoA* genes over AOB *amoA* genes, while conditions at the WWTPs in Japan and USA promoted growth of AOB.

Keyword: Effluents, Thailand, USA, Japan, lake**O7-22 DEVELOPMENT OF DESIGN METHOD FOR LOCALIZATION OF JAPANESE JOHKASOU TO EU AREA**Masahiro Furuichi^{1,2,3}, Siqi Zhang², Jun Hibino², Osamu Nishimura³, Hiroshi Yamazaki⁴¹Johkasou System Association, ²Houstec Inc., ³Tohoku University, ⁴Toyo University

For environmental conservation of closed water bodies such as lakes and bays, the promotion of wastewater treatment facilities that can remove not only BOD but also nitrogen, one of the causes of water-bloom and red tide, is desirable. To apply Japanese johkasou to other countries, it is necessary to modify the design of johkasou to harmonize with the local life style and environmental characteristics. For this purpose, this study examined the localization of Japanese johkasou for the EU region where the performance evaluation method for such facilities has been established. Focusing on the amount of wastewater and the pollutant load which differ in the performance evaluation tests between EU and Japan, an EU-oriented facility was designed with BOD volumetric load equal to Japanese facility. This facility was experimented in France, and the results were compared to those of the Japanese prototype model. As a result, the effluent quality of the EU-oriented facility was maintained at the same level as the Japanese model even when the influent BOD load increased to 120% of the preset value. This result indicates that the most common design method in Japan using BOD volumetric load is effective for designing EU-oriented facilities, but there is a possibility that the volume of the facility may be over-designed. Furthermore, to maintain the ability to remove nitrogen, it is important to keep the water temperature in the facility above 13° C.

Keyword: localization, performance evaluation test, domestic wastewater solution, small-scale wastewater treatment facility, design method**O7-23 PROBLEM ALLIGATOR WEED MANAGEMENT PRACTICES IN INBA-NUMA LAKE FOR FLOOD DESASTER RISK REDUCTION AND SUSTAINABLE EFFORT TO CONTROL INVASIVE WATER PLANTS**Masami Hasegawa¹, Toru Sasaki², Takuya Mineta³, Hiroyuki Shibaike⁴, Norio Hayashi⁵, Osamu Takahashi⁶, Hiroki Minagawa⁷, Jun Nishihiro¹, Akihiko Kondo⁸, Mayumi Oyori⁹, Sae Nakayama¹⁰, Hiroki Takai¹⁰, Hisako Ogura¹¹, Keinosuke Motohashi¹², Hiromasa Suzuki¹³, Yuusuke Koori¹³, Tarou Shooji¹⁴, Takuji Yoshida¹⁵, Hiromi Suzuki¹⁵, Kanako Yamauchi¹⁵¹Toho Univ, ²Japan Water Agency, ³Institute for Rural Engineering, National Agriculture and Food Research Organization (NARO), ⁴Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (NARO), ⁵Natural History Museum and Institute, Chiba, ⁶Kashimagawa River Land Improvement District, ⁷The second term Farm irrigation project office of Innbanuma, ⁸Faculty of Science, Chiba University, ⁹Public Works Research Institute, ¹⁰International Volunteer University Student Association, ¹¹NPO Environmental partnership, Chiba, ¹²The Environmental Fund for Imbanuma, ¹³River Environment Division, Chiba Prefecture, ¹⁴PACIFIC CONSULTANTS CO., LTD., ¹⁵Yachiyo Engineering Co., Ltd.

In Lake Inba-numa, located in the north-west of Chiba prefecture, the lake water is drained from Owada drainage pumping station to control flooding. However, the Alligatorweed, the Invasive Alien Species (IAS), are overgrown in the tributary rivers flowing through the lake and they drift to, attached to and block the screen of the pumping system in times of flooding. To prevent them from negatively affecting the drainage pumping function as a flood-control measure, the attached Alligatorweed are removed from the pumping system by hand or by the use of heavy machines. In order to avoid this situation in advance, Chiba prefecture, involving its local citizen and student volunteers, are engaging in removal activities of Alligatorweed. This research paper illustrates the background, present situation and the future challenges regarding the problems of Alligatorweed in the Lake Inba-numa. Subsequently, it looks into the local cooperation cultivated in the course of activities related to Alligatorweed and examines the possibility for local revitalization through solving the problems. Additionally, as these activities can be considered to be related to the conservation of biodiversity, which is one of the concrete policies towards achieving SDGs, the necessity to strengthen cross-cutting cooperation is suggested.

Keyword: paddy field development in Inba-numa basis, flood control facility, Invasive introduce species, SDG's, local community development

O7-24 FUNCTIONALITY AND UTILIZATION OF NATIVE CHESTNUTS IN INBA-NUMA

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water chestnuts which is growing in Inbanuma marsh in Chiba Prefecture, continues to grow year by year due to eutrophication, making it impossible to secure fishing grounds and tourism routes that have been used in the past, as well as deteriorating water quality and offensive odors. As a result, although the harvesting and landing work (FIG. 2) is carried out every year, there is a problem that the disposal cost increases. This study revealed that polyphenols in chestnuts grown in Inbanuma marshes are more effective than green tea catechins, which are said to have a cosmetic effect. The use of this product in cosmetics will lead to the revitalization of the area around Inbanuma.

Keyword: Economic incentive measures

07-25 HYGIENE AND SANITATION OF PEOPLE LIVING ON AND AROUND TONLE SAP LAKE: COMPARISON OF WATER BASED, WATER-LAND BASED AND LAND BASED ZONES

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This study aimed to collect the information on water use, hygiene and sanitation and waterborne diseases among people living on the lake and the lakeshore. The stratified sampling survey was conducted in three regions around Tonle Sap Lake (TSL) involving a total of 542 families, which were randomly selected for the interview, comprised of 202 Land base (LB) households, 132 Water-landed base (WLB) households and 208 Water base (WB) households. The results of the survey showed that TSL water was the principle drinking water source of WB population (52.9%). For populations in LB, well water was the main drinking water source (71.8%). Related to water treatment systems, 53.5% of LB, 34.9% of WLB and 22.6% of WB used filtration system to treat their drinking water. Boiling of water for drinking was done by 37.1%, 20.5% and 32.7%, of LB, WLB and WB, respectively. Diarrhea and severe diarrhea were waterborne diseases frequently found in this study. Diarrhea disease was found in 60.4%, 80.3% and 79.8% of adults, 39.8%, 61.3% and 75.3% of children under 5 years old and 42.4%, 67.1% and 72.9% of older children and adolescents, for LB, WLB and WB, respectively. People living in WB and WLB zones seems to have high incidence of diarrhea disease as compare to that living in LB zone. This may be due to the drinking water source, water treatment systems and flooded experiences.

Keyword: Tonle Sap Lake, Water base, Water-landed base, Land base, Waterborne disease

07-26 SUCCESSFUL RESULTS OF THE ECOLOGICAL SANITATION APPROACH TOWARD HARMONIOUS COEXISTENCE OF THE PEOPLE AND LAKE MALAWI, AFRICA

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Lake Malawi collects surface and ground water from the west bank. Water pollution of the lake is mainly caused by poor sanitation, domestic and agricultural waste waters. The rural communities still face famine, due to poor infrastructure hindering from their economic growth. Malawi rural communities need comprehensive development models that could solve the problems of infrastructure such as safe drinking water supply, proper hygiene and sanitation, and agricultural food security. Nippon International Cooperation for Community Development (NICCO) with Kyoto University implemented the comprehensive development projects for seven years. in two prefectures of Malawi covering about 3,600 families of 18,000 people, in the support of Mitsui & Co .Environment Fund, JICA and Ministry of Foreign Affairs of Japan. The programs of safe water supply and eco-logical sanitation (Eco-san) were essential to protect water environment of Lake Malawi. This paper discusses success, failure and the further problems of the ecological sanitation approach.

Keyword: appropriate technologies for developing regions, economic incentive measures, domestic wastewater control, water purification and wastewater treatment, food production

07-27 THE CHALLENGE FOR LAKE VICTORIA PROTECTION BY THE ECOLOGICAL SANITATION APPROACH IN KENYA

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Lake Victoria faces serious water pollution by point and non-point sources. As to point pollution control, it is all most impossible to construct sewerage systems to all communities. House-hold sanitation system is instead affordable and preferable. Nippon International Cooperation for Community Development (NICCO) with the support of Kyoto University implemented an ecological sanitation project in Bushiangala Village of Kakamega County, Kenya, since 2014. It is a comprehensive village development, but water supply and ecological sanitation are key components to boost agricultural products and improve income. Along the comprehensive development project, women are strongly involved in the project so that women status is elevated. Nitrogen and phosphorus of point sources are derived from 35 million people of the entire catchment of Lake Victoria. Total construction cost of one million Eco-san toilets is estimated to be 300 US\$ x one million which is most economical solution for water and sanitation issue that is the number six target of SDGs, clean water and sanitation.

Keyword: appropriate technologies for developing regions, economic incentive measures, domestic wastewater control, water purification and wastewater treatment, food production

O7-28 AN ENERGY-SAVING AEROBIC PURIFICATION OF WASTEWATER AND DRINKING WATER BY THE SLANTED-SOIL-CHAMBER METHODMasato Kiji¹, Shohei Oono², Kazuhide Maruyama³, Hideshi Sasahara⁴¹YONDEN CONSULTANTS CO., INC., ²National Institute of Technology, Kagawa Collage, ³Shin Nippon Air Technologies Co., Ltd., ⁴Incorporated Administrative Agency Japan Water Agency

We developed a method of effectively purifying wastewater and drinking water by the self-purification of surface soil. In this method, polluted water is purified by infiltrating and biological adsorption for running it in a carrier of a thin chamber. We called this method "Slanted-Soil-Chamber Method". The purification properties of this method are as follows: (1) a low energy consumption type aerobic purification unnecessary for aeration, (2) concurrent purification of organic pollutants and nutrients, (3) shortening of the hydraulic retention time by separating pollutants and the water, (4) strong ability of decomposing organic substance in the chamber, (5) sludge volume loses weight by the advanced food chain, etc. Purification tests for the drinking water were conducted in Sri Lanka and Bangladesh. In the former, raw water with an average BOD of 37mg/L, which could not be treated by the Slow Sand Filter Method, was treated with good results. We got high quality treated water. In the latter, well water contaminated with heavy metals was purified. Iron, manganese and arsenic purification was confirmed. The results of these experiments show that Slanted-Soil-Chamber Method is an economical and an energy-saving aerobic purification of wastewater and drinking water.

Keyword: Purification technology of drinking water and wastewater, Appropriate technology in the developing area, Slanted-Soil-Chamber Method, Self-purification of surface soil, Biological adsorption

TS8-1 COMMUNITY PARTICIPATION IN INTEGRATED WATER RESOURCE MANAGEMENT IN NORTHERN THAILAND



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Water is one of the most important global resources. Thai people have been facing both quantitative and qualitative problems of water for decades. Northern region is the main headwater of Thailand where Ping, Wang, Yom and Nan watersheds are located. The heads of those 4 rivers are extremely important for Thai people. The four communities including MaeLaOop, MaeChiangRaiLum, PhaTang and DongPhapoon were selected as case studies which located in Ping, Wang, Yom and Nan watershed respectively. Each watershed locates in various geographic conditions. The people analyzed and solved their own problems by different ways of management. MaeLaOop community, representative of Ping watershed, came across the drought and flood seasonal problems by designing and constructing three-layer check dams. These check dams worked also as "wet firebreak" to limit the forest fire area. PhaTang community, representative of Yom watershed, has been facing flooding and soil erosion problems in rainy season. The local people constructed numbers of local material based check dams to come across those problems with community participation. MaeChiangRaiLum community from Wang watershed and DongPhapoon community from Nan watershed have been facing severe logging and shifting cultivation problems which lead to drought and landslide problems. The local people constructed numbers of low cost and local material check dams along the mountainous slope with creating and effective forest restoration project. The "highland wet forest" could narrow down the problems. Not only adult activities, but also local teenagers, as youth power, keep running their activities under the concept of environmental sustainable development.

Keyword: community participation, water resource management, check dam, agricultural area

Curriculum Vitae

Education Background

1996 - 2000: PhD (Environmental Toxicology), Imperial College of Science, Technology and Medicine, University of London, UK
1993 - 1995: MS (Biology), Chiang Mai University, Thailand
1987 - 1991: BSc (Biology), Khon Kaen University, Thailand

Award

Outstanding researcher on *Social and Community Services*, Faculty of Science, Chiang Mai University in 2004

Administration Position

2013-present: Head, Department of Biology, Faculty of Science, Chiang Mai University
2010- 2013: Director, Doi Suthep Nature Study Center, Faculty of Science, Chiang Mai University
2010- 2013: Assistant Dean, Faculty of Science, Chiang Mai University

Research Interest

Biodiversity of Aquatic Insects
Environmental Education
Limnology
Environmental Toxicology
Biomonitoring Using Macroinvertebrates
Water Resource Management

Technical Session 8: Citizens' Activities and Environmental Education Invited Lecture

TS8-2 ESD & SDGS, BEYOND THE ENVIRONMENTAL EDUCATION**Kazuyuki Mikami**

Former President of Miyagi University of Education

We experienced terrible pollution “Kogai” at the end of the 20th century and got over it by the effort of people and unexpected events of oil shock. Then, environmental education developed and thereafter ESD (Education for Sustainable Development) was put forward in 2001. ESD has been promoted especially during DESD (2005-2014). We are still facing with issues on the sustainable development now. The UN adopted SDGs (Sustainable Development Goals) in 2015. I believe that ESD becomes more important to achieve the Goals by 2030.

The environmental issues were partly brought sometimes by the result of science development, but some issues will be cleared by the science itself. Sustainable science is required and promoted now. At the same time, we should look back over the past. In Japan, we have a word “On-Ko-Chi-Shin”. It means learning a lesson from the past. For example, we had a culture of “Mottai-nai” that is a Japanese word which means an unnecessary or wrong use of money, substances, energy, etc., but it has been rather neglected by modern people. Nobel-Prize winner Dr. Maathai noticed it's importance.

ESD encompasses a wide range of fields. To promote ESD, many groups (NPO, NGO, institutions, companies, etc.) are organized in Japan. It is important for these groups to communicate and collaborate to achieve the SDGs. As the central institution, the ESD Resource Center was recently established by MEXT and Ministry of the Environment.

I would like to mention about the situation of civic activity at the 8th session, from the view point of ESD activity in local area, that is, Miyagi pref.

Curriculum Vitae

1994-2007:	Professor of biology, Miyagi University of Education
2000-2005:	Director, Environmental Education Center, Miyagi University of Education
2007-2012:	Director (General-Affairs Vice President), Miyagi University of Education
2012-March 2018:	President, Miyagi University of Education
2011-2017:	Promoted ESD as a member of Japanese National Commission for UNESCO

Technical Session 8: Citizens' Activities and Environmental Education Section 1: Participation and Collaboration 1

O8-1 WELCOME TO SHISHITUKA SATOYAMA WOODLAND. LET'S DO IT TOGETHER

Hironori Oikawa, Nobuo Morimoto

certified nonprofit organization for nature conservation and history transmission of shishitsuka satoyama

In Shishitsuka of Tsuchiura City, Ibaraki Prefecture, there lies a "satoyama" woodland of about 100ha varied terrain surrounding the "Shitsuka-Oike" pond, including wetland and grassland thickets, rice paddies and streams, which is home to many creatures. When the neighboring Tsukuba Tenno pond is included, the area doubles 200ha. This is the largest of its kind between Tokyo and the foot of Mt Tsukuba. The area being close to the city, many people can readily enjoy nature and relax. Cultural and historic sites represented by the Nationally Designated Historic Site Kamitakatsu shell mounds are also present, where the wisdom of "satoyama" is handed down to current generations. Since the Shishitsuka nature & history group's inception in 1989, it has been continuously active in conserving the valuable satoyama, woodland. For example: Satoyama volunteer work, tambo school, pond conservation, Shishitsuka rice ownership, observation meeting, Research, collection of historical and cultural information publicity. Shishitsuka satoyama was a threatened development plans, and in disseminating Japan's SATOYAMA initiative to the world from Shishitsuka.

Keyword: citizen participation, collaboration, SATOYAMA (community forest) conservation, get-close-to-water activities, nature conservation

O8-2 ENVIRONMENTAL EDUCATION IN SATOYAMA OF THE LAKE INBA SOURCE AREA

Takae Kusano, Hisao Suzuki, Tooshi Yamzaki, Nobumasa Okamoto

Non profit organization NPO Tomisato-no-Hotaru

We are NPO "Tomisato-no-Hotaru". Our active field is called Tenjinyatsu where is located Tomisato city in Chiba.

The field is related to the source of Inba Lake. Our activity is protecting and maintaining the field which is a habitat of fireflies. Though our conservative activity, we find out that we need to protect not only a habitat of fireflies but also the surroundings whole area. The fireflies are making a continuous cycling of life with many creatures there. How should we keep our conservative activity in future? To solve this issue, we are focusing on children. We teach children the splendor of nature in order to let our activity continued. We start building good relationship with local kindergartens, elementary schools, junior high schools, and high schools. We visit kindergartens and schools and give classes about nature and its creatures. We also invite more than 3,000 children or students to our field a year. They enjoy eating edible wild grasses, playing in the field, and they feel the nature. We are expecting one or two of the children may come back to us and help our activity in near future. Our activity is always gazing 10 or more years ahead. We realize that if we give up the activity, this valuable circumstance easily fade away. Once it has done, it is almost impossible to rebuild this natural environment. That's why our activity is very important.

Keyword: satoyama maintenance, human resources development, raise awareness

O8-3 SUSTAIN RICH WATERSIDE LANDSCAPES FOR NEXT GENERATION

Iyoko Kanazaki, Yoshiaki Kohno, Akiko Naka

AKANOI

NPO Houjou-no-sato, established in 1996 to regain rich ecosystem at Akanoi Bay in Lake Biwa, currently consists of 431 individuals and 80 groups members. Presuming environments of a Akanoi Bay can be achieved through improvement in environment 8 rivulets flowing into it riverside renovation was initiated in 1996 at one of the neglected rivulets, Meta-gawa. Through renovating riverside landscape including island construction and riverbank repair and following monthly maintenance by Houjou-no-sato members and collaborates, recovery in the riverside ecosystem has achieved, enabling to offer biotope-park for various citizen activities such as field study, stroll and picnicking. Facing with decreasing number and increasing age of active members, study session on ecomaintenance for parent-and-child and taking-in internship students have commenced for aiming to groom successors, which starts to materialize realising a young board member recently.

Keyword: direct contact with nature, nurturing young talent, citizen participation, illuminate consciousness

Technical Session 8: Citizens' Activities and Environmental Education Section 1: Participation and Collaboration 1

O8-4 REGIONAL EFFORTS TO PROTECT AND CREATE BEAUTIFUL AMANOHASHIDATE, ASOKAI AND ITS WATERSHED, "THE THREE MAJOR SCENERIES OF JAPAN"Hiroaki Kirimura¹, Hideki Miyata¹, Yoshitaka Matushima², Makoto Moro³, Yoshihisa Shimizu⁴¹Kyoto Prefectural Tango Regional Promotion Office Department of planning and General Affairs Planning and Promotion Division, ²Miyazu City Office, ³Yosano Town Office, ⁴Research Center for Environmental Quality Management Kyoto University

Asokai, an enclosed coastal sea separated from the open sea by a natural reef, Amnohashidate, one of the three sceneries of Japan. The eutrophication has progressed due to changes in people's lifestyle since the period of high economic growth, and its water quality and sediment have been deteriorated accordingly. As a result, problems such as malodor generation, oyster island formation due to its abnormal propagation, and loss of clams and fishing grounds occurred. Local affiliates and governments, and experts together formed a cooperative meeting for creating beautiful Aso Sea environment, promoting efforts such as coastal cleaning and enlightenment. We also formulated "Aso Kai Basin Vision" in 2015. And in the same year, the surrounding two relevant local governments, Miyazu City and Yosano Town simultaneously issued, "Ordinance to Create a Beautiful and Prosperous Sea of Aso and Connect to the Future" to implement the foundation to promote efforts throughout the watershed. Many students belonging to the International Volunteer University Student Association have participated in the large-scale oyster shell recovery activities since 2015, and efforts to utilize the collected oyster shells have also progressed. We are all working together on a regional basis with the cooperation of volunteers in conservation of Asokai, our "Local Treasure."

Keyword: Citizen Participation, Collaboration, SATOYAMA(community forest) conservation, Utilizing oyster shell

O8-5 M.A.T.H. FOR YAMAN NG LAWA: STRATEGIES FOR SUSTAINABLE DEVELOPMENT OF THE WEALTH OF THE LAKE THE CASE OF LAGUNA DE BAY, CALAMBA CITY, PHILIPPINES

Cynthia Caburnay Buen, Eufrocino Guerrero, Tessa Mar Espino
City Agricultural Services Department, City Government of Calamba

Yaman ng Lawa (YNL) or Wealth of the Lake Project started as a research project funded by the Research Institute of Humanity and Nature, Japan and implemented by the LakeHEAD Research Team from Japan and University of the Philippines. It primarily aims to provide avenue for exchange of ideas between the scientists and local fisherfolks.

The City Government of Calamba adopted the YNL concepts and principles; used them in designing programs for fishery resource management. The project was implemented using the adaptive community-based management approach, wherein the "technology" used comes from the fisherfolks, adapting to their needs, and was backed-up by scientific principles.

To ensure the sustainability of the YNL project impact, the City Government of Calamba through the City Agricultural Services Department designed the M.A.T.H. in Adaptive Co-Management of Fishery Resources as implementing strategies of the project. M.A.T.H. stands for: M - Mentoring the future generation; A - Accessing partnership; T - Technology and Information Dissemination; H - Home and Family-Based Approach.

For almost six (6) years, through the implementation of M.A.T.H. strategies, YNL continuously became a project that celebrates environmental success and embodied social commitment of the City of Calamba that can also be adopted and implemented in other lakeshore communities in the Philippines. Through M.A.T.H. lakes and humans can co-exist harmoniously, leading to sustainable development of the wealth of lake resources, benefitting the community around it.

Keyword: citizen participation, nature conservation, wise use and development of water resources, advocacy, community building

O8-6 MY LAKE LANAO PROJECT: A CLEAN LANAO FOR A PEACEFUL MINDANAO

Maria Cecilia Ferolin, Lynrose Jane Genon, Sittie Noffaisah Pasandalan
Mindanao State University-Iligan Institute of Technology

Lake Lanao in Mindanao, the southern part of Philippines, is one of the world's ancient lakes. It is a cultural heritage of the Meranaws and a strategic economic resource of the country being a major source of hydropower. The lake is an important source of water, subsistence and livelihood for the Meranaws. However, the agricultural practices, pollution, logging, as well as the construction of a series of dams, have caused deterioration of the Lake. If left unabated, the livelihood, health and food security of the Meranaws will be seriously affected. Following sustainable human development framework, the My Lake Lanao Project (MLLP) attempts to address these multiple and interconnected problems of the Lake and lakeshore communities. Interventions include community-based projects integrating livelihood and lake conservation, education and awareness campaigns mobilizing school-based and community-based youth. MLLP adopts a collaborative participatory processes, evidence-based approaches and need-responsive programs. Employing a modified action research approach, this study examines the social processes of MLLP implementation, focusing especially on the responses of local communities and their level of awareness on existing programs for the protection of the Lake. The research reveal the crucial role of the collaboration among local communities, non-government organizations, people's organizations, local governments and the academe, as a *collective agency*, in attaining the objectives of poverty alleviation, environmental conservation and peace advocacy.

Keyword: collaboration, citizen participation, capacity building, awareness, SDGs

Technical Session 8: Citizens' Activities and Environmental Education Section 3: Participation and Collaboration 3**O8-7 THE CHANGING ROLE OF COMMUNITY IN THE MANAGEMENT OF RESERVOIRS IN JAKARTA**

Gutomo Bayu Aji

Research Centre for Population, Indonesian Institute for Sciences

The reservoirs made by the Dutch colonial government in Jakarta have undergone drastic changes in the role of the community over the last one hundred years. The purpose of this study was to find out how the communities negotiate with the government and compete with private business interests. The research method is observational and depends on an in-depth interview as a key informational source. The results of the study indicate that the changing role of the community is caused by, (1) water resource laws do not provide space for the participation of local communities; (2) the land around the reservoir is controlled by the private sector for urban expansion; (3) the reservoirs have changed in function from agricultural irrigation to flood control; and (4) many reservoirs are polluted and silted. Some communities that demonstrate the capability of managing the reservoirs are largely dependent on the following factors, (1) social ties within communities that affect solidity in determining the importance of managing reservoirs; (2) the role of village community leaders in establishing relations with the government as a crucial step toward the success of negotiations in the management of reservoirs; and (3) the combination between the two factors already listed affects the success of a community competing with private developers in reservoir management. This study concludes that the community's ability to maintain relationships with stakeholders demonstrate their capability in taking on the role of managing reservoirs also influence the continuity of the respective reservoir's function as a water source.

Keyword: Reservoirs, Role of Community, Management, Water resources

O8-8 STAKEHOLDER PARTICIPATION FOR DETERMINING RESEARCH DIRECTION OF PHAYAO LAKE, THAILAND

Santiwat Pithakpol, Kanyanat Sunthornprasit, Luethaipat Pimolsree, Siriluck Valunpian, Witoon Taludkham, Dutrudee Panprommin, Rattasak Pengchata

University of Phayao

Phayao Lake is one of the most important lake in Thailand and provides many benefits to the city of Phayao and lake basin. Settlements, agriculture, tourism and fishing are some of the major uses of the lake basin, making community involvement a necessary component of its management. The aim of the study was to explore the knowledge and perceptions of local communities regarding the critical problems, situation of the lake management and possible future research direction. Three key processes were carried out including 1) collect and synthesize available knowledge from previous research articles and publications, 2) integrate lake development plans with available knowledge, and 3) determine strategic research directions for the lake using stakeholder participation. More than 200 research articles have been published in the past decade. Most of the studies were related on the lake but only a few of them have been used in policy making process or development plan. Future lake strategic research directions could be determined in four main areas; development of ecosystem balance for sustainable use of natural resources; development of economic potential especially tourism competencies; restoration of social issues and management deregulation; improvement of inhabitant health status. The vision and strategies of the lake research and development were also pointed out by participatory process. Lesson learned from this study was lake management should include the integration of academic research, local government development plan, and stakeholder participation.

Keyword: lake management, stakeholder participation, research direction, sustainable development

O8-9 IMPLEMENTATION AND EVALUATION OF THE "TIRTA BUDAYA SITU" WATER CULTURE PROGRAM ESTABLISHED FOR URBAN LAKES WITHIN THE JAKARTA METROPOLITAN AREAAmi A. Meutia^{1,2}¹Kyoto University, ²UP 45 University

A water culture program titled "Tirta Budaya Situ" was implemented in and around several urban lakes (*situ*) within the Jakarta metropolitan area (*Jabodetabek*). The program encouraged communities situated nearby to urban lakes to hold activities for maintaining the lakes by launching cultural or sports events in which direct involvement with the lakes and their surrounding land were practiced. The hypothesis is that community activities taking place near the lakes will increase people's awareness of the lakes' healthy ecosystems and functions. If communities need an urban lake in their area, they will maintain the urban lake. The implementation was conducted at Situ Rawa Badung in East Jakarta, Situ Bojongsari in Depok, Situ Binong in Bekasi, Situ Bungur in Tangerang Selatan, and Situ Gintung in Tangerang amongst others. "Tirta Budaya Situ" supported the community in striving toward a better environment and has thus far added more greenery to the land surrounding the lake by planting trees. Community activities such as cleaning the surrounding lake, cultural festivals, and sport events were supported by us behind the program by, for example, helping communities find sponsorships for such events. After several years of implementation, we drew up an evaluation of how the "Tirta Budaya Situ" program managed to support community activities and strengthen the relationship between community activities and the maintenance of urban lakes. The results demonstrated that, for certain lakes, the more community activities taking place around them, the more the lake is likely to be well maintained.

Keyword: citizen participation, community revitalization, awareness, get-close-to-water activities, culture

O8-10 THE WAYS TO INCREASE ENVIRONMENTAL AWARENESS OF THE ARAL TRAGEDY AND ITS ECOLOGY TODAY

Khairulla Zhanbekov¹, Aigerim Tolegen²

¹University of KazNPU after named Abay, ²University of KazNPU after named Abay, Master of Education Sciences Geography

Today's current textbooks contribute to the development of future specialists, but while teaching any environmental problems, it is important for the trained, competent, qualified specialists to develop their vision of the use of the student's self-study. Therefore the purpose of our research is to study and analyze a specific environmental problem from a scientific research point of view. At present it is already recognized that it is impossible to restore the Aral Sea in the same state and size. Therefore, we can only talk about stabilizing and improving the already existing situation. Although the governments of Kazakhstan and Uzbekistan have already taken appropriate measures and implemented projects that have partially stabilized the situation in the Aral Sea area, but further concrete actions are still needed to improve the complex environmental situation in the Aral Sea basin, taking into account socio-economic development. September 9-17, 2017 the teachers of the University of Tsukuba organized a joint expedition of Kazakh and Japanese scholars where they got acquainted with life, educational institutions and also discussed conducting joint research works. Therefore, it is advisable to make specific decisions, if possible, use space data, unite states and international organizations dealing with this problem and positively resolve this issue, because today the tragedy of the Aral Sea is not only an internal problem of Central Asian countries and Kazakhstan.

Keyword: awareness, curriculum development, nature conservation, collaboration, citizen participation

Technical Session 8: Citizens' Activities and Environmental Education Section 4: Participation and Collaboration 4**O8-11 INITIATIVE BY MAHARASHTRA STATE ANGLING ASSOCIATION (MSAA) TO CONSERVE POWAI LAKE, MUMBAI, INDIA**Farid Hamid Sama¹, Kamlesh Sharma¹, Pramod Bhagwan Salaskar², Eknath V. Muley³¹MAHARASHTRA STATE ANGLING ASSOCIATION, ²NAUSHAD ALI SAROVAR SAMVARDHINI, ³INDIAN ASSOCIATION OF AQUATIC BIOLOGISTS

Powai lake situated 55 meters above the mean sea level (msl) is known as 'Anglers Paradise'. It is meant exclusively for angling and sports and is located about 27 Km away in the north-east of Mumbai city. This lake came into existence in the year 1891, when Mumbai Municipality got constructed a masonry dam of 10 meter height between two hillocks across Powai basin to conserve the rain water for drinking purpose, which later was commonly known as Powai lake, since it impounded in Powai area. Subsequently, the water in the lake was found unpotable because of indiscriminate use of the lake for various purposes by the local people and also due to discharge of domestic sewage from the surrounding localities. Initially this lake was open for the general utilization of the natives and is leased out to Maharashtra State Angling Association (MSAA), Mumbai - an NGO registered in 1955 under the Society's Registration Act 1860 for angling in addition to conservation. This organization being one of the important stake holders and has been stocking the lake with ecologically important species of Indian major carps and endangered species like Mahasheer. These organizations have actively been involved in maintenance of ecological health of this lake.

Keyword: Powai lake, ecological health, stake holders, conservation

O8-12 OUR ESTIMATION AND PROPOSAL ON LAKE KASUMIGAURA RADIOACTIVE CONTAMINATION CAUSED BY FUKUSHIMA POWER PLANT INCIDENTAkio Kikuchi, Teruki Mandokoro, Syuma Seki, Yoichi Kimura, Atsunobu Hamada

Specified Nonprofit Corporation

Lake Kasumigaura has been contaminated by the high level of radiation released from the exploded Fukushima No.1 nuclear electric power plant on March 11 in 2011. We have studied the influence of radiation on the ecosystem of L.Kasumigaura by examining hatching and survival ratios of fish and by checking morphological abnormalities of fishes. We have also monitored the contamination of Cs-134,137 for the bottom and fishes in L. Kasumigaura. Based on these results, we proposed a countermeasure in open forums and discussed. Our countermeasure was rejected by a majority of the floor. Therefore, we gave up proposing this countermeasure for the government agencies. We are going to explain this process and discuss.

Keyword: public participation, radioactive contamination, The Great East Japan Earthquake, Damage to fisheries, Hitachi River floodgate

O8-13 ECOLOGICAL SURVEY ON A SMALL-SIZED URBAN RIVER BY LOCAL COMPANIES AND ITS EXTENSION IN LOCAL SOCIETYTadayoshi Katsura, Keijirou Minami, Shigeyuki Toba, Katsuki Nakai, Shigekazu Miyagi

Konan Kigyoo Ikimono Oendan (Environmental Supporters in Konan Area)

"Environmental Supporters in Konan Area" organized by 17 companies (including the members of Shiga Committee for Economic Development) in the southern part of Shiga Prefecture have conducted environmental survey on a local urban river "Ookami-gawa" at 4 times a year from the fiscal year 2010. This survey contains observation of large aquatic animals such as fish and benthic invertebrates and monitoring of water quality. Taking three points (1) small obligations to facilitate participation, (2) qualification in terms of environmental research and education, and (3) scientific accuracy of obtained data into consideration, this survey has been carried out in collaboration with Shiga Prefecture and KusatsuCity. Extended activities by the local companies have connected stakeholders in the local society through the support of environmental education of an elementary school and the participation in communities' festivals.

Keyword: biodiversity, Small and medium sized business cooperation, Small city river

O8-14 THE HISTORY OF THE ENVIRONMENTAL PROBLEM OF LAKE BIWA AND THE MESSAGE TO THE NEXT GENERATION

Yoshiji Horino

hirose co.ltd.

"Lake Biwa" is an important lake as the water service source of the urban area including Kyoto and Osaka. I involve in the environmental conservation in Lake Biwa to use my study and my experiments since I was a child.

In the rapid economic growth period, the neighboring inhabitants rose up to prevent the water quality of Lake Biwa contaminating. The movement that is called "washing powder motion", led to the constitution of "the regulations for preventing eutrophication of Lake Biwa".

I have investigated the water quality in Lake Biwa based on the regulations for many years, and I hand down the significance of this civil movement to release the results.

I pass on the environmental issue in Lake Biwa to next generation in order to let people know the important role for the water service source. Furthermore, I expect that more people engage in the conservation of Lake Biwa environment in the future.

Keyword: environmental study, eutrophication

Technical Session 8: Citizens' Activities and Environmental Education Section 5: Ecological Conservation

O8-15 TAMURA · OKUJUKU · TOSAKI AREA NATURAL RESTORATION PROJECT

Naoto Yoshida, Kenta Izuohara, Masakazu Sakurai

Kasumigaura River Office, Kanto Regional Development Bureau, MLIT

Kasumigaura Tamura, Okujuku and Tosaaki area nature restoration project is based on the Law for Promotion of Nature Restoration. Since the project was established in October 2004, 29 project meetings have been held by March 2018.

The facility maintenance of the project area is almost completed in FY 2017.

We are discussing how to cooperate and operate these facilities such as maintenance and maintenance of vegetation zones.

We conduct environmental management activities such as mowing and picking up garbage twice a year.

Furthermore, as a means of conservation such as vegetation, in 2016, a management method of conducting burning was conducted experimentally.

We report on the situation of conservation and rehabilitation efforts of the lakeshore vegetation zone of Lake Kasumigaura.

Keyword: natural regeneration, lake shore vegetation, maintenance cost, natural disturbance, public participation

O8-16 EFFORTS OF "FISH CRADLE PADDY" BY SUHARA SESERAGI NO SATO IN YASU CITY, SHIGA PREFECTURE

Ayao Hori, Masashi Tomita, Kiwa Akamatsu

Suhara-seseraginosato (Local residents organization)

"Suhara Sesaragi no Sato" in Yasu City Suhara district, Shiga Prefecture work on "Fish Cradle Paddy Field" that simultaneously rice cultivation and fish growth in paddy fields. It is an effort to restore the ecosystem once destroyed by the agricultural infrastructure development project, and it is implemented in about 20 areas around Lake Biwa in Shiga prefecture, and the Suhara area is one of them. "Suhara Sesaragi no Sato" not only improves fields such as setting up fish ladder to support fish upstream and growth, reducing agricultural chemicals and agrochemicals cultivation, promotion sales of cradle rice produced in cradle paddy fields, environmental education, providing the place of urban-rural exchange. We are aiming to increase the number of consumers and understanding people through these activities and to continue activities on a steady and sustainable.

Keyword: Citizen participation, Vitalization of local area, Awareness raising

O8-17 THE URGENT PROBLEM OF INVASIVE ALIEN AQUATIC PLANTS IN TEGANUMA AND WHAT CIVIC GROUPS CAN DO

Hiroko Hanzawa, Hisako Ogura, Junko Takeuchi, Masako Yakuwa, Kazuie Nakano

Association of civic groups which love beautiful Teganuma

In 2017, we faced the urgent problem of invasive alien aquatic plant named Oobana Mizukinbai, *Ludwigia grandiflora* subsp. *grandiflora* in Teganuma, which is a lake in northern Chiba prefecture. This plant has been a huge problem in Lake Biwa in Shiga pref. Shiga pref now use 300,000,000 a year for the measure to this plant. We know now that Teganuma is late to the initial measure. This problem can be the problem in all lakes or ponds in Japan. We introduce the present situation of invasive alien aquatic plant problem in Teganuma, involving Nagae Tsurunogeitou, *Alternanthera philoxeroides*, which we civic groups have tried to make a measure before Oobana Mizukinbai.

Keyword: civic activities for environmental preservation, environmental preservation, Satoyama, contact with the nature and creatures in and around waterside

O8-18 THE COOPERATION WITH VARIOUS ORGANIZATIONS BY UNIVERSITY STUDENTS IN REMOVAL ACTIVITY OF INVASIVE ALIEN AQUATIC WEED IN LAKE BIWA, JAPAN

Yume Tanaka

International Volunteer University Student Association

In Lake Biwa, a new invasive alien aquatic weed, namely *Ludwigia grandiflora*, growing tremendously has become a serious problem. Here we describe the process of activities. 1) About the background of starting removal activities by students. 2) The procedure of activities in cooperation with a wide range of sectors in Moriyama city and about the each role. 3) The proactive removal activity throughout the southern part of Lake Biwa by students.

In addition, we report the effect of the public relations activities to raise recognition and consciousness of ecological crisis. To ask the prompt movement of administrations and strengthen bonds with companies and residents are equally important.

Keyword: invasive alien aquatic weed, cooperation with various organizations, *Ludwigia grandiflora*, early detection and removal, public relations activity

Technical Session 8: Citizens' Activities and Environmental Education Section 6: Education Program and Practice 1

**O8-19 COMPREHENSIVE ENVIRONMENTAL LEARNING ACTIVITIES AT EVERY LIFE STAGE
IN SHIGA, THROUGH THE PERSPECTIVE OF EDUCATION FOR SUSTAINABLE
DEVELOPMENT**

Yoshichika Akasaki

Shiga Prefecture

In order to solve environmental problems and make a sustainable society, it is essential for everyone to take action of their own initiative, recognizing the connection between these challenges and their lives. Residents of Shiga have a will to proactively protect Lake Biwa on an individual basis; for example, more than 100,000 people participate in clean-up activities around Lake Biwa Day, July 1, every year. Environmental learning plays a major role in expanding such environmental actions in order to build a sustainable society. This is why Shiga, through the perspective of Education for Sustainable Development, promotes environmental learning to nurture people who can not only notice, learn and think about, and act on various environmental issues, but also take proactive actions towards building a sustainable society.

Keyword: citizen participation, Environmental Education

**O8-20 EDUCATIONAL PROGRAM OF THE CENTER FOR WATER ENVIRONMENT STUDIES,
IBARAKI UNIVERSITY**

Yuji Kuwahara

Center for Water Environment Studies

The Center for Water Environmental Studies (CWES) consists of common use facilities where environmental education and research are performed on Lake Kasumigaura all facilities are on the lakefront of the town of Kitaura. In 2013, CWES was recognized as an education-related joint usage facility by the Ministry of Education, Culture, Sports, Science and Technology. In this paper, we introduce the history of CWES and our educational program in water environmental studies.

Keyword: training of personal, development of the curriculum, awareness building

08-21 "WETLANDS AND YOUTH" SESSIONS AT THE ASIA WETLAND SYMPOSIUM AND ITS ACHIEVEMENTS

Takuma Satoh¹, Tatsuya Togari¹, Yuma Sato¹, Atsushi Tanabe¹, Reiko Nakamura²

¹Youth Ramsar Japan, ²Ramsar Center Japan

"Youth Ramsar Japan (YRJ)" is an NGO, organized by Youth ranging from junior high school students to graduate students, have been conducting the CEPA activities for wetland conservation aimed at the Ramsar Convention. YRJ held "Wetlands and Youth" session at the "8th Asia Wetland Symposium (AWS)" from 7th to 11th November in Saga City, Saga Prefecture, Japan. "Wetlands and Youth" session was held for establishing a relationship on a continuous basis through the discussion about wetland issues to exchange opinions and examples by youth generation who has wetland activities in Asia countries. 34 youths from seven countries participated in the "Wetlands and Youth" session. In its presentation part, the participants introduced their daily activities in wetlands. Furthermore, in its discussion part, 21 representatives discussed lively the theme about "What kind of activities can youth do for the conservation of wetlands in the future?" from a unique perspective of youth. The participants in the session created a Facebook group to exchange opinions and examples on a continuous basis. The "Saga Statement", which was adopted at AWS, declared the importance of youth participation in wetland conservation.

Keyword: Communication, Awareness, Cooperation, Ramsar Convention, Youth

08-22 EXPANDING THE POSSIBILITY OF LAKE ENVIRONMENTAL EDUCATION BY USING VIRTUAL REALITY TECHNOLOGY

Eisuke Hayaoka

Hokkaido University

On October 15, 2017, students at Hokkaido university CoSTEP, Communication in Science & Technology Education & Research Program, conducted the environmental education event "Immerse into the virtual Lake Shikotsu world!" to use virtual reality (VR) technology for elementary and junior high school students at the Sapporo Science Center.

We took underwater omnidirectional video footage at Lake Shikotsu in August 2017 using a full spherical video camera capable of shooting in all directions such as horizontal and vertical. We edited the VR video contents so that viewers with VR goggle could feel like they are swimming under water and observing.

In using VR technology for environmental education learning, the reproducibility of the underwater environment and the ecosystem in the water is important. Because the river is flowing, it is difficult to shoot underwater with VR. However, it is relatively easy in the lake. Also, unlike ordinary flat images, VR images are required to have ideas that encourage viewers to participate actively.

Therefore, I found three important points. 1) To make a movement that people seek out objects. 2) To make participants understand how the observation space is arranged. 3) Characters are required to guide gaze.

CoSTEP students who produce this event could have a real experience at the lake. For elementary and junior high school students who experienced VR, environmental education effect could be obtained by VR technology. In this way, I think that lake environmental education using VR technology has double educational effect.

Keyword: virtual reality, full spherical video, environmental education, virtual reality (VR) technology

08-23 "INBA-NUMA LEARNING" -HUNAHO SATOYAMA IS THE HOMETOWN OF LAKE INBA-NUMA-

Hisako Ogura¹, Yoshihumi Furushima¹, Yoshimasa Suzuki²

¹The Committee for Lake Inba-numa Watershed Management, ²Inzai Municipal Hunaho Elementary School

Hunaho elementary school, established in 1873, is a very small rural school in Inzai city. In old time, Lake Inba-numa was so familiar as to be put in the school song, but after the reclamation, the lake has become estranged from the school zone. And at the same time, the awareness to the lake of the people living there also has lost. So we tried to teach about to restore the good relationship between Lake Inba-numa and the Hunaho area community as "Inba-numa Learning" in cooperation with the community. For example, children heard about the old life or folk tales about Inba-numa from old persons, visited springs or Satoyama. By these lessons, children learned that their hometown is very important as the sources of Lake Inba-numa even now. At the same time, all of the community became to be proud of their hometown, and the relationship between the community and school grew strong.

Keyword: curricula development, Satoyama conservation, awareness education

Technical Session 8: Citizens' Activities and Environmental Education Section 7: Education Program and Practice 2

O8-24 COMMISSIONED PROJECTS OF KASUMIGAURA CITIZENS' ASSOCIATION

Kaoru Yoshida, Yoshie Mayama, Kazuo Okubo

Kasumigaura Citizens' Association

"The Citizens' Association for the World Lake Conference" was started in September 1993. We, member of this association, participated aggressively in the 6th World Lake Conference (WLC6) with the 4 group partnership of administrations, industries, researchers, and citizens. After the conference, "Kasumigaura Citizens' Association" was established in 1996 considering the mind of "The Lake Kasumigaura Declaration" adopted in WLC6. We have been active for 23 years in order to raise the interest of the people to the Lake Kasumigaura where a various purifying measure still continues. In this paper we report two commissioned projects which the Kasumigaura Citizens' Association has been working on, that is, 1 Survey on water quality in inflowing river into the Lake Kasumigaura and 2 Interchange salon promotion project of the Ibaraki Kasumigaura Environmental Science Center. Commissioned project is often constrained and has a lot of hard work. But in addition to raising awareness among residents in and outside the prefecture, there is also the purpose of strengthening organization and expanding membership within the Kasumigaura Citizens' Association. In taking on the commissioned project involving the administration, we decided to develop sustainable activities while maintaining a "cooperative relationship with a feeling of tension".

Keyword: riparian areas, collaboration, awareness, community, culture

08-25 LIAISON COUNCIL ACTIVITIES OF SAKURA RIVER EXPEDITION

Kazuo Okubo, Tetsuo Wada

Kasumigaura Citizens' Association

The Sakura river is 63 km long and the catchment area 350 km², which is the largest river among 56 rivers flowing into the Lake Kasumigaura. In June 2003, the "Liaison Council of Sakura River Expedition" was formed for the purpose of raising interest in water environment of children and the inhabitants of the Sakura river basin, and causing of the trend which works on improvement of water quality of Sakura river and Lake Kasumigaura. This council is composed of 23 organizations, such as municipalities in watersheds, civil society groups, and the branch office of the prefecture. The activities of the expedition can be roughly divided into "exploration exchanges" and "participation in water quality surveys". "Exploration exchanges" are held three times a year to raise interest in the Sakura River basin and "participation in water quality surveys" is conducted twice a year, mainly by municipalities to grasp the condition of water quality. While encouraging participation by children and many residents, we are promoting activities to raise awareness about the purification of water quality at the Sakura river, which is a familiar river, leading to the purification of the Lake Kasumigaura.

Keyword: citizen participation, awareness, riparian areas, collaboration, community development

08-26 EFFECTS OF CHILDREN'S AWARENESS AND UNDERSTANDING OF NATURAL ENVIRONMENT BY ENVIRONMENTAL LEARNING ACTIVITIES FOR RIVERS CONDUCTED AT LOCAL ENVIRONMENTAL INSTITUTE

Shunichi Miwa

Ibaraki Kasumigaura Environmental Science Center

In recent years, a slow improvement of environmental education and learning, a lowering of children's interest in natural environment, and a drop in their awareness of environment are matter of growing concern. Through the cooperative activities between us and schools on the environmental education done in the rivers into Lake Kasumigaura, their influences on children's awareness and understanding of natural environment are analyzed using questionnaire survey and imagemap analysis before and after the activities. The results show that such activities induced a rise in children's interest, consciousness and knowledge on the rivers, and a deepening of understanding, their usefulness and dynamics.

Keyword: Awareness raising

08-27 INFLUENCE OF REGIONAL DIALOGUE ON AWARENESS OF RIVER BASIN RESIDENTS ON WATER ENVIRONMENT

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¹Fukushima Prefectural Centre for Environmental Creation, ²National Agriculture and Food Research Organization

Fukushima resident's decreased awareness of water environment of river has been a concern since the TEPCO's Fukushima Dai-ichi Nuclear power plant accidents. The objective of this study is to clarify the influence of regional dialogue with awareness of river. We held a workshop on the water environment for resident's of two river basins in Iwaki City, Fukushima Prefecture. Before and after the workshop, we conducted questionnaire surveys on 'image' and 'goodness' of river to the participants and compared the results. As a result, the participant's awareness of river improved after the work shop. This seems to be because stakeholders in river basins with various degrees of interest in the water environment shared information. Regional dialogue is expected to lead to an improvement in the awareness of the prefectural people who have declined to the water environment after the nuclear accident.

Keyword: regional dialogue, water environment, raise awareness

Technical Session 8: Citizens' Activities and Environmental Education Section 8: Education Program and Practice 3

O8-28 THE ENVIRONMENTAL PROBLEMS OF LAKE KASUMIGAURA BROUGHT UP ON THE NHK TELEVISION PROGRAM

Shimako Kawamura

University of Tsukuba

This study investigated the environmental problems of Japanese lakes brought up on the NHK television program. From these environmental problems, Lake Kasumigaura in particular was analyzed. The environmental problems of Lake Kasumigaura were first televised in 1973. The first environmental problem was fish kill and great outbreak of Algae in this year. Thereafter, there was a program which brought up water pollution as environmental problem of Lake Kasumigaura televised for several years until 1995. The contents changed from influence on fishery and drinking water to water pollution and water quality improvement measures. These measures were televised as a proposal for improvement of environmental problems of World Lake in 1995. After 1995 the program brought up environmental problems other than water pollution, and suggested diversity of environmental problems of Lake Kasumigaura. Television programs stored environmental condition of Lake Kasumigaura, action of resident and opinion for environmental problems. They are precious records to know Lake Kasumigaura past times, and common information from the different years and generations. It will be useful for the environmental learning and improve people's environmental consciousness.

Keyword: Lake's environmental problems, television program, social concern, environmental consciousness

TS9-1 IMPLEMENT BETTER-GOVERNANCE FOR THE INTEGRATED RIVER BASIN MANAGEMENT IN LAKE BIWA-YODO RIVER



Norio Nakatsuka

The Organizing Committee of the World Masters Games 2021 Kansai

This report is about an efforts of UNION OF KANSAI GOVERNMENTS to resolve the upcoming issues in Lake Biwa - Yodo River Basin, Japan such as increased flood/ draught risk, deterioration of the ecosystem under global climate change and the regional population decline.

Many of current problems in Lake Biwa - Yodo River Basin have been out of concerns for traditional sectors in the compartmentalized government structure so that the responsibilities have been pushed onto others or overlooked. Therefore, the better governance, not only to encourage individual effort but also to promote appropriate collaboration and cooperation among diversified actors, are becoming more essential for the resolution. Then objective/ scientific evidence, which can be the basis of decision-making, is one of most effective drivers to improve the governance. Indicators, which can evaluate the various statuses in multi-scale, can give various actors (from individuals, NGOs, private sectors, cities, prefectures to national governments) incentives to act. Each resolution is generally made through a cycle such as 1) Recognize the current situation - 2) Set (Reset) agenda - 3) Establish framework for collaboration and corporation - 4) Plan and Implement. The cycle should be kept on following again and again so as to formulate integration of policies. To encourage this upward spiral process effectively, UNION OF KANSAI GOVERNMENTS as "Stagehand" who integrate available knowledge and intelligence of so-ciety and environment in the basin, is beginning to work.

Curriculum Vitae

April 1978: Joined Hyogo Prefecture

April 2007: Director-General, Prefectural Policy Planning Bureau, Hyogo Prefecture

April 2010: Director-General, Tajima District Bureau, Hyogo Prefecture

April 2011: Secretary-General, Union of Kansai Governments

April 2018: Secretary-General, Organizing Committee for World Masters Games 2021 Kansai

Technical Session 9: Integrated Lake Basin Management (ILBM) Invited Lecture**TS9-2 INTEGRATED LAKE BASIN MANAGEMENT (ILBM)
AS AN INTEGRAL PART OF TRANSFORMING THE
MALAYSIAN WATER SECTOR****Salmah Zakaria**

ACADEMY OF SCIENCES MALAYSIA (ASM)

The Academy of Sciences Malaysia (ASM) recently produced the publication, "Transforming the Water Sector: National Integrated Water Resources Management Plan - Strategies and Road Map". The focus was to highlight the interconnectivity between all water sub-sectors, both within the resources and services management, from an overarching and integrated perspective, so as to provide a foresight for future sustainable development, in line with the anticipated Sustainable Development Goal 6 (SDG 6). The precursors to this publication were several ASM Component Plan studies (IWRM Sub-theme) and summary briefs and reports/expert reviews on lakes, groundwater, water and climate changes, water supply and wastewater, river basins, agriculture water, urban water, water research, national key priority areas on water, flood management, water quality, water and land use, water and gender, water and green growth, water-food-energy nexus, water financing, advocacy, awareness creation, international networking and collaboration, etc. The analysis were presented as strategies and road map in a national IWRM (Integrated Water Resources Management) plan. Twenty five (25) recommendations were proposed, clustered under the four IWRM pillars namely, enabling environment, institutional arrangements, management instruments and investments in water infrastructure.

This paper included discussions on how ILBM processes were pursued, within the proposed collective National IWRM Plan. Details in the appendices included summary briefs on Integrated Lake Basin Management (ILBM).

Keyword: Integrated Water Resources Management, Integrated Lake Basin Management, Water Resources Management, Water Services Management, the Malaysian Water Sector

Curriculum Vitae**Academic qualifications:**

1987-90: Ph.D. (Water Management in Deep Peat Soils in Malaysia), Silsoe College, Cranfield Institute of Technology (now - Cranfield University), United Kingdom
 1985-86: M.Sc. (Land & Water), Cranfield Institute of Technology (CIT), UK
 1981-82: Post-Grad Dip (Hydraulics), IHE, Delft, the Netherlands
 1971-77: BE (Civil Engineering), Universiti Teknologi Malaysia

Professional positions:

2017-current: Professional Engineer, BEM (Board of Engineers Malaysia)
 2015-current: Chair ASM (Academy of Sciences Malaysia) Water Committee
 2008-current: Fellow, Academy of Sciences, Malaysia (FASc) . Life membership.
 2007-current: Member, Board of Directors of Selangor Waters Management Authority (LUAS)
 2000-current: MIEM (Member of Institution of Engineers Malaysia)
 2012-14: 2nd Co-chair APWF/ADB Steering Group team on the APWF/ADB Water Knowledge Hub for Climate Change Adaptation
 2012-13: Member of CATALYST (EU Capacity Development for Natural Hazards Risk Reduction and Adaptation group).
 2012-15: ESCAP's alternate focal person to APWF (Asia Pacific Water Forum) Governing Council
 2011-15: ESCAP's alternate focal person to UN-Water
 2011-15: ESCAP focal person to Mekong River Basin Commission (MRC),
 2010-14: Associate Fellow, Institute of Strategic and International Studies (ISIS), Malaysia
 2010-14: Member of Steering Group (SG) on WKHCCA (Water Knowledge Hub for Climate Change Adaptation) for APWF/ADB
 2010-11: Member of Scientific Advisory Group (SAG) on UNEP Water program
 2009-11: Lead Author, IPCC SREX, Chapter 6
 2007-13: SC (Steering Committee) member, AguaJaring Southeast Asia, IWRM Capacity Building network, CapNet/UNDP
 2007-08: Member, Board of Directors of CREAM (Construction Res Inst, Malaysia)
 2007-08: Member, UPM Advisory Panel for Master's Program in Engineering
 2007-08: Chair, WG 2, V&A, Malaysia's NC2 preparation to UNFCCC
 2007-08: Chair, AguaJaring Southeast Asia,
 2005-08: SC GWPO (Global Water Partnership Organisation), Stockholm
 2004-08: Focal Point, Malaysia, Water Environment Partnership in Asia (WEPA), Japan
 2004-05: Regional Focal Point, GWPSEA ToolBox,
 2002-05: Secretary, MyWP (Malaysian Water Partnership)
 2002-08: Treasurer, NAAM (Netherlands Alumni Association of Malaysia), -current
 2002-08: Panel Member, MARDI, IRPA Research Study on Peat Soil
 2002-05: Member, GWPSEATAC (GlobalWaterPartnership SoutheastAsia Technical Advisory Committee)
 2001-10: Fellow, Lestari (Institute for Sustainable Development), UKM

Employment record:

2008-2015: Economic Affairs Officer, UN ESCAP (United Nation Economic and Social Commission for the Asia and the Pacific), Bangkok, Thailand
 2005-2008: Director General, NAHRIM (National Hydraulic and Research Institute of Malaysia)
 2002-2005: Director, Corporate Development Division, Department of Irrigation and Drainage (DID), Malaysia.
 1999-2002: Director, River Engineering Division, DID, Malaysia,
 1995-1999: Head, Hydraulic Engineering, NAHRIM, Malaysia
 1995-1989: Senior Engineer, Drainage Section, DID Headquarters, Malaysia
 1989-1984: PhD and MSc Research in Cranfield Institute of Technology, United Kingdom
 1984-1982: Senior Engineer, Planning Section, DID Headquarters, Malaysia
 1982-1981: Post Graduate Course in Hydraulic at Delft Hydraulic Institute, the Netherlands.
 1981-1980: Senior Engineer, Planning and Design Unit, North West Selangor Integrated Agricultural Development Project.
 1980-1979: Engineer, the Kuala Lumpur Flood Mitigation Projects, DID Federal Territory, Malaysia
 1979-1977: Engineer in Planning Section, DID Headquarters, Malaysia.

Research summary:

An early exposure to irrigation and agricultural drainage planning and design, led to a doctoral research on "Water management in deep peat soil in Malaysia". The three years field research was carried out on local peat soil in the Pontian district, Johore. Returning from the doctoral thesis, the focus was on hydraulic structures. Later, as the Director of River Engineering Division, my interest turned to river basin management with focus on the overarching and holistic Integrated Water Resources Management (IWRM), and Urban Storm Water Management (USWM, now known as IUWM). IWRM was included as a national policy since 2001, in the 8th Malaysia 5-year Plan. USWM was accepted as a national policy by the National Council on Local Authorities in 2002. As the Director of Corporate Development, research focus and analysis were on policy outreach, both technical and management. This included institutional study on restructuring the DID, to ensure better effectiveness for services provided, as well as being Malaysia's focal point in WEPA, Japan. Heading NAHRIM, my personal focus of research turned to lake basins management and climate change impacts, although coastal management, water quality and hydraulic structures formed part of my core businesses.

Working in UNESCAP provided the opportunity to share my knowledge on water at the international level, as well as being introduced to new knowledge on water issues such as water and green growth, water-food-energy nexus, circular economy and the development of SDGs. There were also interactions with ESCAP member countries in the Asia-Pacific as well as international organizations such as MRC, ASEAN, APWF, ADB, UN-Water, UNEP, UNESCO, IUCN, other NGOs and UN organizations.

There is a need to look at the whole water sub-sectors in an overarching and integrated manner to support sustainable development and management. Being a Fellow of ASM and currently the Chair of the Academy of Sciences Malaysia (ASM) Water Committee, allow for cross-cutting analysis of both the water resources and services management. The ASM has since 2008, published papers on Lake Management, Groundwater Management, Climate Change Impacts on Water related issues, IWRM/IRBM, Management of Research, Investments in Water, Water Supply & Wastewater Management, Water Demand Management, Agriculture Water and Integrated Urban Water Management. My interactions with ILEC, started when I was in NAHRIM and continues until now.

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 2: ILBM and Lake Basin Governance 1

O9-1 GOVERNANCE GAPS AND PROSPECTS IN THE STA. ROSA WATERSHED OF LAGUNA LAKE, PHILIPPINES

Ria Adoracion Lambino¹, Crispina Muan², Jocelyn Siapno², Rose Bonifacio², Adelina Santos Borja², Noboru Okuda¹

¹Research Institute for Humanity and Nature, ²Laguna Lake Development Authority

While bringing economic success, urbanization processes have resulted in stress and undesirable consequences such as pollution and depletion of water sources, sedimentation, flooding, biodiversity loss and degradation of lake and river systems that impact public health, food security, livelihoods and well-being. Using Sta. Rosa Watershed in Laguna Lake Philippines as a case study, this paper examines the evolution of local institutions that aim to mitigate these issues at the watershed scale. Challenges to watershed governance are examined using institutional and stakeholder analysis. Prospects for expanding and sustaining the capacity of the existing institutions are articulated to address multiple issues and mitigate concerns in this urbanizing landscape.

Keyword: basin governance, collaboration, wise use and development of water resources

O9-2 INTEGRATED LAKE BASIN MANAGEMENT IN MALAYSIA - A DECADE OF EVOLUTION

Fatimah M Yusoff^{1,3}, Zati Sharip², Salmah Zakaria³, Mohd. Fauzi Mohamad², Azuhan Mohamed², Shahrizaila Abdullah³

¹Universiti Putra Malaysia, ²National Hydraulic Research Institute of Malaysia, ³Akademi Sains Malaysia

Integrated Lake Basin Management has been adopted in Malaysia for over a decade. This paper provides a review of the various national initiatives and studies concerning lake and reservoir management that have been undertaken in Malaysia. It detailed the evolution of ILBM implementation in the country over more than a decade since its inception in 2005 in particular the governance improvement as well as areas of lake research and management. The paper concludes with challenges that need to be addressed as the way forward to enhance ILBM implementation.

Keyword: ILBM, Governance, Lake Management, Sustainable

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 3: ILBM and Lake Basin Governance 2**O9-3 CONSERVATION OF WETLANDS IN BHUTAN**Sonam Choden

Ramsar Focal Point, Royal Government of Bhutan

Benevolent leaders and associated strong environmental policy is the impetus of environmental conservation in Bhutan. Never - the - less, greater challenge exists today with faster paced modernization, as Bhutan advents into the 12th five-year planning cycle. Changing ecosystems and their services, is more visible and challenges in the water sector with the cascading phenomenon in the food-energy-climate nexus is growing. In the past, an ecosystem-based approach to conservation was rarely visible as a common policy directive in the sustainable management of environmental resources in the country. The roadmap for wetlands conservation, followed by the Royal Government of Bhutan is envisaged to build information on wetlands, achieve the sustainable development goals, assess wetlands, build management plans for significant wetlands, and continuously monitor and evaluate the conditions of wetlands in the country. With this roadmap, the country envisions to add value to Bhutan's legacy to environmental conservation through an ecosystem based approach with an effective wetlands conservation program.

Keyword: Wetlands conservation in Bhutan; Ecosystem based conservation; Watershed management; Wetland Policy; and upstream-downstream linkages., wise use and development of water resources, effects of climate change, future scenarios of surface waters

O9-4 CONSTRUCTION OF PARTNERSHIPS TO IMPROVE INTEGRATED MANAGEMENT OF LAKE CHAPALA BASIN, MEXICOAlejandro Juárez Aguilar, Nelida Orozco, Felipe Alatorre, Rosendo Garcia, Andres Gonzalez, Rene Velazquez

Institute Corazon de la Tierra

From 2002 to 2017 a series of 94 projects have been completed in the Lake Chapala basin (Mexico) by the Institute Corazon de la Tierra; they were directed to improve the conditions of terrestrial and aquatic ecosystems and the Environmental Services they provide. Creating partnerships has been a core part of this process, to properly deal with complex ecological, social and economic aspects, including conflicting activities and points of view regarding access and use of natural resources, most importantly, water and forests. This paper reviews the features of the strategies used to create effective partnerships, the challenges that were faced and how they were dealt with, in order to create a deeper involvement of stakeholders beyond their particular location and socio-political position, to involve them as a group into the integrated management of Lake Chapala basin, a strong collaborative effort that still has a challenging way ahead.

Keyword: Integrated Lake Basin Management(ILBM), basin governance, basin management policies

O9-5 PEACE & GOVERNANCE: CHALLENGES FOR SUSTAINABLE DEVELOPMENT OF LAKE LANAO, SOUTHERN PHILIPPINESSukarno Tanggol, Maria Cecilia Ferolin

Mindanao State University-Iligan Institute of Technology

One of the world's ancient lakes, Lake Lanao in the province of Lanao Sur, southern Phippines, is home to the Meranaws, a Muslim group who inhabit the area since precolonial times. Lake Lanao is also a major economic resource of the country being the source of water of six hydropower plants, the Agus Powerplant Complex, which provide a big bulk of electricity to Mindanao, the country's southern most island and home to more than 30% of Filipinos. Lanao Sur is one of the poorest province and known to be hotbed of violent conflicts in the country, ranging from clan violence to historical Moro/Muslim armed secessionist rebellion and other forms of "shadow economy". Against this social backdrop, the study inquires on the state of sustainable development of Lake Lanao. From a survey of 500 respondents, key informant interviews and on-site observation, the study reveals that Lake Lanao matters has not trigger conflict among the locals. However, the professional groups and development actors in the area, private and government alike, deplore the absence of, or poor, governance of Lake Lanao which, they argue, abetted the socially and environmentally damaging monopolistic control and utilization of the Lake by a government-owned and controlled corporation. The study highlights the (a) challenges of competing resource use, between local - subsistence and cultural - versus national, highly economic ; and (b) effective governance in addressing peace and security in the locality as pillars of sustainable development.

Keyword: basin governance, ecosystem services and basin management policies, sustainable development, cultural heritage

O9-6 MEXICAN WATERSHED NETWORK, A PROPOSAL TO WORK ON THE INTEGRAL MANAGEMENT OF LAKES IN MEXICO

Eduardo Rios Patron, Ignacio Daniel Gonzalez Mora, Alejandro Juárez Aguilar

Red Mexicana de Cuencas

Mexican Watershed Network (MWN) was formed in 2007 as a result of the 1st. Nacional Watershed Congress which was held in the city of Santiago de Querétaro in Mexico. In 2011 the Network began a systematic and voluntary work with a new Strengthening Strategy focusing on four axes: dissemination and communication of information, generation of synergies, linkage, coordination and collaboration, strengthening technical capacities and systematization of national information on integrated management of watersheds in Mexico. The Network is formed today by more than six hundred members, 30 % of them with a complete update of basic individual information in a database. The Governance structure of the MWN is shaped by a Directive Board, an Advisory Board, an operational group and specific technical groups. One of this groups, with Integrated Lake Basin Management (ILBM) approach, is being generated in order to develop a better understanding and diagnosis of Mexican lakes, and its watersheds, and then build the appropriated synergies and capabilities towards the 18th World Lake Conference to be held in Mexico in 2020. This technical group must base its work on an interdisciplinary and multi-institutional fundaments and will present its first results in different forums of the 5th National Watershed Congress and its corresponding 1th Latin-American Congress to be held in 2019 at Mexico.

Keyword: network, Mexico, watershed, ILBM, synergies

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 4: ILBM Institutions and Their Typology 1**O9-7 IMPACTS OF RECENT ENVIRONMENTAL CHANGES ON THE LIVELIHOODS OF FISHING COMMUNITIES IN THE TONLE SAP LAKE (TSL)**

Pham Ngoc-Bao¹, Binaya Raj Shivakoti¹, Tetsuo Kuyama¹, Hul Seingheng², Heng Naleak², Naret Heng³,
Neth Baromey³

¹Institute for Global Environmental Strategies (IGES), ²Institute of Technology of Cambodia (ITC), ³Royal University of Phnom Penh (RUPP)

The Tonle Sap Lake (TSL) is among the most productive freshwater ecosystems, and one of the most fish-abundant lakes in the world. It is connected with the Mekong River by the Tonle Sap River. The TSL absorbs a huge volume of water, which helps to reduce flooding in the Mekong River floodplains during the peak flooding season, then releases water into the Mekong River during the dry season, which vital to maintain ecological flows and to prevent salt intrusion into the Mekong delta. Local communities who live in or around the TSL are well adapted to this hydrological phenomenon of the Mekong River and TSL. Local livelihoods are also deeply dependent on natural resources and services that the lake and its floodplains provide, including agriculture, trade and fishing, three most important livelihood sources. This study investigated impacts of and the recent environmental changes on the livelihoods of the fishing communities in and around the TSL. More specifically, the study intends: (i) to examine socio-economic and environmental changes occurred in and around the lake and its causes; (ii) to explore the impacts of these changes on the livelihoods of fishing communities; (iii) to identify the strategies that could enhance the resilience of the local communities and reduce their vulnerability.

Keyword: environmental changes, fisheries, livelihoods, socio-economic, Tonle Sap Lake

O9-8 ROLE OF LOCAL AUTHORITY IN INTEGRATED LAKE BASIN MANAGEMENT: EXPERIENCES FROM MALAYSIA

Minhaz Farid Ahmed, Mazlin Bin Mokhtar, Elfithri Rahmah, Lubna Alam, Goh Choo Ta, Khai Ern Lee

Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia (UKM)

ILBM (Integrated Lake Basin Management) is relatively a new concept in Malaysian context if it is compared to IWRM (Integrated Water Resources Management) and IRBM (Integrated River Basin Management), however, it can be fit in nicely and quickly because of relatively good understanding and buy-in from stakeholders at various levels in Malaysia. ILBM is quite a natural approach for Malaysia because there are so many lakes in the country such as natural lakes, ex-mining lakes, man-made lakes, and other multi-purpose lakes including for HORAS (hybrid off-river augmentation system) uses in Selangor State, etc. There are already active committees at the policy level on lakes as well as research and development levels too, including those chaired by several government agencies. Therefore, lakes may quickly and efficiently bring ordinary people closer to proper water management because of aesthetics and recreational attractions of lakes including for fishing, relaxation and retention purposes for water discharged or runoff from residential and business areas and estates. The key success factors for ILBM, based on literature review and informal interviews, is community buy-in along with embracement and enculturation of ILBM principals as well as aspirations for human and ecosystems health. In Malaysia, if there is a bold and sincere leadership of local authority, then the maximum of the implementation of ILBM can be won. Moreover, if there is support by academia and business professionals for expertise sharing and knowledge transfer, then the ILBM can be achieved entirely to promote the sustainable development in Malaysia.

Keyword: Water Pollution, Drinking Water, Socio-economic, Sustainable Development

O9-9 RIVER/LAKE CHIEF, A NEW CONCEPT PROPOSED BY CHINA TO IMPROVE WATER ENVIRONMENT

Zhengyu Hu, Hongzhu Wang, Haijun Wang

State Key Laboratory of Freshwater Ecology and Biotechnology, Institute of Hydrobiology, the Chinese Academy of Sciences

With an aim to promote better coordination among government departments to protect the water bodies, the central government of China has decided to establish a nationwide river and lake chief system to cover all rivers and lakes by the end of 2018. It is expected to cover the provincial, city, county and township levels. Heads of provincial-level regions will be general chiefs responsible for all rivers and lakes in the region, other top officials at provincial, city, county and township levels will act as chiefs responsible for different parts of the water bodies. Responsibilities of the chiefs include water resource protection, pollution prevention and control, and ecological restoration. Their job performance will be assessed, and they will be held accountable if environmental damage occurs in the water bodies they oversee. Information including names and responsibilities of the chiefs will be made public to ensure public supervision. China firstly appointed local government officials as chiefs in 2007 to address problem of blue-green algae bloom in Lake Taihu, Jiangsu Province. Zhejiang Province began testing this new system in 2008 and expanded it across the whole province from 2013. In this presentation, we'd try to introduce this new concept and also its the achievement and challenges we've seen.

Keyword: River Chief, top officials, sustainable development, water environment

O9-10 NATIONAL SECTOR PROGRAMME (NSP) FOR WATER RESOURCES MANAGEMENT 2018-2030 IN ALBANIA, AS A PLATFORM TOWARDS 2030 SDG 6

Arduen Karagjozi¹, Hantin Bonati², Gerta Lubonja¹, Albert Lenja¹, Albana Idershaj¹, Klejdi Ngjela¹, Viola Saliaga¹, Eni Mazniku¹

¹Technical Secretariat of National Water Council, ²Ministry of Transport and Infrastructure

National Sector Program for IWM is a important step to successfully achieve one of the government's priorities and to implement 2030 SDG 6. It has been established in close cooperation between the line ministries, development partners, local government units and academics.

The program is based on the principles of sustainable development, comprehensive approach and transparency by ensuring the economic, social and environmental development of the country.

The NSP for IWM intends to ensure vital needs, competitiveness in usage, water risk reduction, contemplating ecosystems sustainability, climate change, risk reduction from floods, economic development etc.

In the legal and technical aspect, this program determines the frameworks for achieving the set of goals, but at the same time it has the flexibility and dynamism to adapt depending on particular situations.

This program establishes a single national, strategic water sector framework and improves budget planning methodology based on prioritization of funding within and between different objectives in the water sector.

It provides a new approach to medium-term budget planning by increasing transparency, effectiveness, harmonization, prioritization of projects, linking of each budget item to objectives and monitoring of indicators.

Also, the harmonization between sectoral investments made by the central and local government without interference to the local competences, is one of the issues that is solved through this program, integrating and harmonizing it in the planning phase of the budget preparation

Keyword: National Sector Programme, integrated water management, SDG 6, budget planning, water sector framework

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 5: Ecosystem Service Assessment 1**O9-11 FACTORS AFFECTING STAKEHOLDERS EVALUATION ABOUT LAKE BIWA BASIN**

Naoko Hirayama, Nozomi Takeshima

The University of Shiga Prefecture

Lake Biwa is the largest freshwater lake in Japan and valuable commons not only as being water resources, but also as being places for nurturing unique ecosystem and creating its exceptional culture and landscape. Shiga Prefectural Government drew up the long-term comprehensive conservation plan for Lake Biwa in 2000. The plan sets down the future vision of the lake in 2050, and the planning periods of phase I for 2000-2010 and phase II for 2011-2020. The planning process should be based on social consensus including people's values for the plan accepted by a wide range of stakeholders.

We collected 97 data by questionnaire about depth of the problem and level of satisfaction related to Lake Biwa, river, paddy field and forest. In addition, I asked age, living place, living-term in local area and relationship with lake about informant. As the result, we clarified below; 1) over 50 years old people felt dissatisfied regarding every content and they evaluated there were any problem at paddy and forest field, 2) people they have live in Shiga prefecture during over 10 years evaluated there were any problem at river and paddy field, 3) people they have deep relationship with lake evaluated there were any problem at paddy and forest field and they were dissatisfied to those, 4) Shiga residents have low evaluation about forest.

Keyword: Lake basin conservation, Evaluation with stakeholder, Shiga prefecture

O9-12 PERCEPTIONS, ATTITUDES AND PREFERENCES FOR WETLAND ECOSYSTEM SERVICES: A CASE STUDY OF TAMPARA, ODISHA

Ritesh Kumar, Dushyant Mohil, Ajit Pattnaik, Ritesh Sikka

Wetlands International South Asia

Wise use of wetlands is predicated on the extent to which primary stakeholders, especially local communities participate in the management of these ecosystems. Limited empirical data on behavioural dimensions of ecosystem services and communities' response to management of these services impedes effective integration in management. We used Ecosystem Services Shared Value Assessment (ESSVA) tool to assess community perceptions, preferences and attitudes for ecosystem services of Tampara, a freshwater lake located along the eastern coast of Odisha State in India. Data from 278 structured questionnaire survey of basin communities and eight focal group discussions indicated that the demographic, socioeconomic and spatial heterogeneities within these communities had a significant influence on attitudes and preferences for 19 ecosystem services identified as being derived from the wetland. Relative significance for ecosystems services, mainly provisioning services varied when communities responded as a group as compared with when responding as an individual. Spatial location in the basin, gender, occupation and ownership of assets had a significant bearing on the preferences for ecosystem services. Communities directly dependent on the wetland perceived their role in restoration and management as being more prominent as compared with governments or other management agencies. A segmented and spatially nuanced understanding of ecosystem services, as enabled by the ESSVA tool, provides the basis for broadening stakeholder engagement in management for wise use of wetlands.

Keyword: Wetlands wise use, Ecosystem services, perceptions, lake basin management, ESSVA

O9-13 ECOSYSTEM HEALTH CARD FOR LAGUNA DE BAY AND ITS TRIBUTARIESJocelyn Gazmen Sta. Ana¹, Adelina Santos Borja², Gregory Alexis Ongjoco³, Bileynnie Ponce Encarnacion⁴, Ireneo Bongco⁵

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An Ecosystem Health Card (EHC) provides simple and clear presentation of the current ecosystem health of a water body based on certain indicators. The first Ecosystem Health Card for Laguna de Bay was for 2013, where the lake scored a low passing mark of C- which is equivalent to 76%. In 2016, the EHC assessment was extended to the rivers that drain into the lake and it was named as LGU scorecard, with reference to the Local Government Units in a river basin. The same water quality parameters used in the 2013 assessment were used in the lake and river assessment. The score attained in 2016 was even lower at 72 % or a failing mark of D attributed to high phosphate concentrations and high chlorophyll a content. The East Bay garnered the highest score among the lake stations for having the least built-up areas. With the issuance of the new Effluent Standards where nutrients are already among the regulated parameters for industrial and commercial sources, the increasing nutrient loading into the lake can be effectively addressed.

Keyword: water quality, water pollution, ecosystem management, ecosystem health card, scorecard

O9-14 MAIN OUTCOMES, RESULTS AND LESSONS LEARNT FROM THE INTERNATIONAL WORKSHOP ON INTEGRATED LAKE BASINS MANAGEMENT (WITH SPECIAL EMPHASISON ON THE IMPORTANCE OF ESSVA[1] IN THE ILBM FRAMEWORK IN WEST AFRICA). [1] ECOSYSTEM SERVICES SHARED VALUE ASSESSMENT

Salif Elhadji Diop, Birane Cisse, Saly Sambou

Academy of Sciences of Senegal

From February 27 to March 2018 in Dakar, ILEC organized an International Workshop on Integrated Lake Basins Management (ILBM) with a focus on West African Lakes status and the current patterns for integrated lake basins management in Africa.

Discussions on lakes and wetland ecosystems were held and conducted in the framework of multiple crisis recorded in the sub-region, such as: climate change and extreme events, population growth, cities expansion, ecosystems degradation and poverty, pollution, etc. The objective of workshop was to develop guidelines in terms of research and collaboration with the African scientists and managers in order to develop knowledge and initiate research action especially in the area of the preservation and development of integrated lake basins management and ecosystems. One particular area of focus was the compliance with laws and regulations and the need to develop areas of cooperation between West African countries and experts in order to adopt common approach on research and methodologies in the area of lake basins, watersheds and wetland ecosystems integrated management.

Today's challenges are mostly focused on drinking water supply to large coastal cities populations, food self-sufficiency of lakeside villages and cities and the improvement of living conditions of populations living around lake basins. Thus the importance of integrated management of lake basins systems that takes into account the interface between the different pillars of ILBM process and the role of ecosystem approach in the context of improving the governance of lake basins, as largely discussed during the workshop.

Keyword: basin management for sound water circulation, basin governance

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 6: Ecosystem Service Assessment 2**O9-15 ECOSYSTEM SERVICES VALUATION FOR URBAN LAKE AND WETLAND - A CASE OF PUTRAJAYA**Normaliza Noordin¹, Zati Sharip², Nur Adila Akma Mahfidz³, Akashah Majizat³, Awang Noor Abd. Ghani⁴¹Perbadanan Putrajaya, ²National Hydraulic Research Institute of Malaysia, ³Eco Development Facilities Sdn Bhd, ⁴Universiti Putra Malaysia

The man-made lake and wetlands in Malaysia's Government Administrative City of Putrajaya has created a unique healthy ecosystem within a city. This encourages many other cities to duplicate the same success condition. At the same time, this achievement needs to be monitored and assessed of its economic values.

What benefit will we get from such a delicate urban healthy ecosystem? It is questionable enquiry that needs to be carefully assessed. This is somehow will also affect the city dwellers that benefit the existence of the ecosystem. Having the understanding of the value of urban ecosystem especially related to water body will also enable the authorities to determine the source of financial assistance for a better management of the water body. This is crucial to ensure everybody will benefit appropriately with their contribution to the well-being of the areas.

Keyword: Ecosystem services, Lake, Urban, Wetland

O9-16 'ENHANCED HYDROLOGICAL CONNECTIVITY' FACILITATED IMPROVEMENT OF LULC STATUS IN THE CATCHMENT AREA OF LAKE CHILIKA: A CASE STUDY FROM PARTNER'S FOR RESILIENCE PROJECT, INDIA

Sasawata Kumar Mohapatra

SPANDAN (NETCOAST)

Worldwide wetlands are suffering from various issues due to development initiatives. Also Natural disasters change the pattern of ecological services provided by the wetlands to the adjacent communities. Chilika is one of the important Ramsar site and largest wetland system of India. The changes in land use and land cover patterns have affected the creeks and natural canals of the lake. The occurrence of frequent floods and cyclones has also blocked the natural passage of water in to it and exacerbated the natural functioning of the wetland. 'Enhanced hydrological connectivity' has taken as a planned ecosystem based measures in building resilience of the communities. It has also taken as a key approach to rejuvenate the water bodies, revival of the creeks and mitigate water logging issues. Moreover this helped in the promotion of sustainable irrigation to 350 acres of crop land, increased flood water absorption capacity as a buffer zone of Lake Chilika and renovation of 3 ponds. The women of the community could gain economic profits from the pond aquaculture. This ultimately promoted the improvement of the LULC (Land Use and Land Cover) status of the area. The scientific LULC study conducted by Integrated Coastal Zone Management Project and Chilika Development Authority (CDA) in 2013 confirms the gain of ecosystem services due to such intervention. The recent LULC status shows 112.7 hectares of creek and 5158.6 hectares of aquaculture promotion in the area.

Keyword: Integrated Lake Basin Management, Ecosystem Management, Disaster Risk Reduction, Sediment release, Lake ecosystem functions

O9-17 PARTICIPATORY BASIN MANAGEMENT AND BIODIVERSITY CONSERVATION IN ANSUPA LAKE, INDIA

Durga Prasad Dash

PALLISHREE

Ansupa is the largest freshwater lake in Odisha, with a catchment area of 5231 hectares. During the last 2 decades the Lake was under threat due to huge amount of sand, soil and debris flowed from the catchments and the river Mahanadi. The average depth of the Lake is 4 metre. Chilika Development Authority initiated participatory lake basin management and sustainable livelihood along with activities for weed management in the lake.

About 30,000 populations in 28 villages around the lake were depending on the Lake for their livelihoods, 70% on agriculture and 25% on fishing. 1836.99 hectares of agricultural crop (paddy and vegetables) depends upon its water. The capacity of the farmers have been enhanced through training programmes to increase the yield in agriculture with organic inputs and the yield increased significantly. Various plantation programmes in 132 hectares were carried out including soil conservation measures like continuous contour bond, staggered and half moon trenches. 8 nos. of new rain water harvesting structures (4.2 hectors) saved the needs of crops in stress period. Special skill building training was provided to fishers. Women SHGs helped in de-weeding the lake.

As a result the biodiversity improved in the lake ecosystem, development of favorable micro climatic conditions for wildlife viz. rabbit, small Indian civet cat, deer, python, hyena, elephants and tiger. Community based institutions like Watershed committees (7), women SHGs (30) and Primary Fisherman Cooperative Society (1) were promoted in the Lake Basin management which contributed significantly in the eco-system and economic growth.

Keyword: Integrated Lake Basin Management, Basin Governance, Ecosystem Services, Wise use and Development of water resources, ground water and surface water

O9-18 VULNERABILITY AND ECOSYSTEM SERVICES ASSESSMENT OF MUDA LAKE BASIN UNDER THE IMPACT OF CHANGING CLIMATE

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Climate change influenced hydrological pattern in reservoir subsequently altered their ecosystem services. Muda Lake Basins support valuable ecosystem services and irrigate the largest paddy fields for the country. This study assessed the vulnerability of Muda Lake Basin to climate change using the Probability Distribution Model rainfall-runoff model and InfoWorks two-dimensional Integrated Catchment Model. The hydroclimate simulation was based on the downscaled global circulation model data to Peninsular Malaysia. Future hydroclimate model showed that the lake catchment will received slightly lower and higher rainfall amount at the mid of 21st century. A much severe rainfall pattern over a long period was projected at the end of 21st century. Simulation results provided pattern of lake hydrologic and hydrodynamic in association to future climatic changes. Long drought at the end of century will be affecting the lake services to supply water for irrigation and domestic. Economic valuation of the impact of climate change on the main ecosystem services during drought and flood events will enable identification of strategies to reduce the associated potential losses to infrastructure and communities.

Keyword: Climate change, Ecosystem services, Lake Management, Tropical lake, Vulnerability

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 7: Climate Change Impact**O9-19 GOVERNMENT DISASTER RESPONSE TO FLOOD AND UTILIZATION OF REMOTE SENSING TO RIVER OBSERVATION ; AN INVESTIGATION IN THE ASIA PACIFIC REGION**Takahiro Kikuchi

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Among the natural disasters in the world, The largest number of afflicted countries among the natural disasters is "flooding" such as floods, storm surges and landslide in the world. Important elements in river and lake disaster prevention are the diversity of gathering information of to the observation network by various sensors such as rain gurge, water gage, wether rader and AMEDAS, in recent years it has been widely used for observation of information by remote sensing using satellite, UAV, drone and access It is recognized as an effective means for observation of difficult remote areas and afflicted areas. Under the circumstances under consideration, based on the actual situation survey in Japan and Myanmar, Vietnam, we will describe the application and the problem to the disaster prevention field in each country river observation system and remote sensing

Keyword: climate change, disaster prevention and mitigation**O9-20 MANAGEMENT OF A TROPICAL FRESHWATER LAKE UNDER A CHANGING CLIMATE AND ENVIRONMENT**Shadananan Nair Krishnapillai

Centre for Earth Research and Environment Management

Lakes are under threat from the impact of environmental degradation and changing climate in India, a country with fast rising population and with several social, economic and political hurdles in manangement. The Sasthamkotta Lake , a designated wetland is the only freshwater lake in the tropical state Kerala. This spring-fed lake is the source of drinking water for 0.5 million people and residence of nearly 27 freshwater fish species. Input of chemicals, fertilizers and pesticides from farms carried through rivers, and the detergents and untreated domestic effluents from urban areas contaminate the lake's water. Rising needs in water and the extremes in local climate as part of global anomalies worsen the situation. Increasig rainfall intensity causes large-sclae erosion in the upper hills and the sediment load carried by rivers threatens the existence of the lake. Degradation of the lake leads to socio-economic issues such as pricing of water, migration, and conflicts. Rules and regulations for the protection of lake become farce bcause of various social and political reasons. In this paper, a comprehensive study of the factors leading to the degradation of the lake, an assessment of the impact of chaging climate and a review of current management measures have been carried out. Guidelines for the better management of the lake have been provided.

Keyword: lake, climate change, degradation, socio-economic, management**O9-21 STUDY ON THE RESPONCE OF WATER QUALITY OF NEARBY LAKES BY THE CHANGE OF ATMOSPHERIC CONDITIONS**Tetuya Nakamura¹, Tadashi Yamada²¹River Front Research Institute, ²Tyuo Univercity

Lake TEGA, INBA, and KASUMIGAURA are nearby lakes in the Toneriver basin with similar atmospheric conditions. Characteristics of water quality change of nearby lakes are similar responding to the similar change of atmospheric conditions, and shows individuality by the different lake conditions such as lake volume. To analyze lake water quality change is useful for integrated water management of nearby lakes.

Keyword: ILBM, water quality management

O9-22 WATER AVAILABILITY AND DEMAND UNDER CLIMATE CHANGE AND POPULATION GROWTH, IN LAKE GUIERS, SENEGAL

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¹University Assane Seck of Ziguinchor, ²University of Bonn, Germany

During the last three decades, increasing population, changing patterns of water demand, and concentration of population and economic activities in urban areas has pressurize Senegal's freshwater resources. To overcome this deficit, Senegal turned to the exploitation of Lake Guiers. It is the sole water reservoir in the country and its water is use for irrigating crops and sugar refinery, as well as a drinking water resource for urban centres. To address the challenges that climate change and population growth poses in Lake Guiers water resources, it is necessary to consider its potential impacts on different dimensions of water resources. In this study, future water availability and demand has been modelled under scenarios of climate change and population growth until 2030, based on the representative concentration pathways (RCPs) 4.5 and 8.5 by applying the Water Evaluation And Planning System model (WEAP). The results show that the pressure on Lake Guiers's water resources will increase, leading to greater competition between agriculture and municipal demand site. Decreasing inflow due to climate change will aggravate this situation. WEAP results offer basis to Lake Guiers water resources manager for an efficient long-term planning and management.

Keyword: water demand, modeling, climate change adaptation, water availability, lake management

Technical Session 9: Integrated Lake Basin Management (ILBM) Section 8: ILBM Institutions and Typology 2**09-23 LAKE BASIN ENVIRONMENT OF THE LAKE CLUSTER POKHARA VALLEY (RAMSAR SITE), NEPAL**Shailendra Kumar Pokharel¹, Juddha Bahadur Gurung², Dr. Bhuvan Keshar Sharma³¹Conservation Development Foundation (CODEFUND), ²President, Conservation Development Foundation (2017-2019),³Coordinator, Conservation Development Foundation.

Lake Cluster of Pokhara Valley comprises nine lakes in Pokhara Valley in the Province-4, and 10th Ramsar Site (Site No.: 2,257) of Nepal covering the basin area of 262 km² with 9 km² of surface water across the Chitwan Annapurna Landscape. Each lake supports significant biodiversity, provides important ecosystem services and sustains local livelihoods and make Pokhara the globally known tourism destination in Nepal.

All lakes are sub-surface drainage basin type, and noteworthy with 362 species of plants comprising 286 terrestrial, 61 aquatic species and 32 species of orchid including 10 endemic one so it considered as the *Orchid Garden*. *Dischidia bengalensis* and *Phreatia elegans* are new plant species recorded where >146 plant species are valuable as NTFFPs including key 82 agrobiodiversity species. Among wildlife 128 species are vertebrates (Mammal: 32 sps; Birds: 40 terrestrial and 52 water dependent sps; Reptile: 24 sps; Amphibian: 11 sps; Fish: 27 sps including 6 alien sps). The cluster hosts a wide variety of globally threatened migratory birds like the critically endangered Baer's pochard and Indian vulture, and mammals like the vulnerable clouded leopard, and the endangered Indian pangolin.

Anthropogenic activities associated to climate change has noted impacts to distress the structure, function and stability of lake ecosystems such as encroachment, siltation, pollution, and invasion by exotic species, so lakes are conditioned to degrade. Implementation of integrated lake cluster basin plan yet developed by government that stakeholders foresee instrumental document in improving lake condition in those lakes.

Keyword: Ecosystem, Lake-Basin, Biodiversity, Encroachment, Pollution

09-24 STAKEHOLDER'S ACCOUNT OF THE SOCIAL AND ENVIRONMENTAL CHALLENGES IN THE LAKE VICTORIA BASIN

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It is important that policymakers are aware of stakeholder's account of the challenges in society in order to develop policy that is relevant and supported by its society. The Lake Victoria Basin would particularly benefit from engaging stakeholders to mitigate the challenges in the region due to its many challenges and diverse stakeholders across the three riparian countries. Therefore, this paper reports on a problem analysis that was conducted with stakeholders in the Lake Victoria Basin. A thorough stakeholder analysis was followed by semi-structured interviews with businesses, NGO's, governmental organizations and communities. The analysis resulted in 12 key issues that were raised by the stakeholders covering social, environmental, health, economic and institutional issues. These issues include: reduced fish catch, water pollution, soil erosion, governance, water hyacinth, alternative livelihood, HIV prevalence, poverty, spread of diseases, land ownership, gender inequality and food insecurity. This paper concludes that a strong partnership between policy makers and stakeholders is crucial in order to mitigate of these issues.

Keyword: Lake Victoria, problem analysis, stakeholder engagement

09-25 LIMNOLOGICAL STUDIES OF LONAR LAKE, BULDHANA DISTRICT, MAHARASHTRA, INDIAAman Vikas Ghutke¹, Vijaykumar Bhikusing Pawar², Kshamadevi Shankarrao Khobragade³

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The Lonar Crater Lake situated in Buldhana District, Maharashtra is a natural crater lake formed by hyper velocity meteoritic impact in basaltic rock before some 50,000 years ago. It has an area of 256.15 hectares and declared as a wildlife sanctuary in 2002. The Lonar crater is said to be the world's oldest and the third largest meteoritic crater. It is surrounded on all sides by a rim ejecta blanket formed from the blocks of basalt, and a steep escarpment to an even height of about 150 m deep. The present study was undertaken to focus the need of its conservation because of its unique ecosystem all over the world.

Unique aquatic ecosystem was developed in the Lonar Lake due to the high pH of lake water. Hence there is urgent need to conserve this world heritage by applying the seven principles, advocated by WLTV (World Lake Vision) by which we can successfully achieve the goal to maintain ecological balance thus resulting into conservation of Lonar Lake.

Keyword: Limnology, Basaltic, Ejecta blanket

O9-26 PROPERTY REGIME CHANGE AND LAKE DEGRADATION: AN INSTITUTIONAL ANALYSIS OF LAKE RAWAPENING IN INDONESIA

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Debate over the effects of different property regimes on natural resource systems has long been controversial. A large body of literature has investigated the links between different property rights regimes and environmental outcomes and shown that common, state, and private property rights regimes are each capable of yielding sustainable environmental outcomes. However, the existing evidence is highly mixed. This study examines how the alteration of property regimes at local level leads to the degradation of the lake by using the perspectives of institutional economics, in particular property-rights approaches. Lake Rawapening is a multifunctional semi natural lake which is currently in environmentally degraded condition. Nearly 70% of its surface is covered by water hyacinth and its depth is in the process of shallowing. As consequences, the lake is not able to provide ecosystem services at optimum level. This research using a case study approach and used data collected from in depth interviews with informants as well as reports and documents related to the lake. The study shows that the current property rights regime in the lake and its catchment area associated with social change is driving local resource users toward greater degradation of the lake. The opportunity exists to build on existing village level institutions to develop a collaborative management system to help protect the lake ecosystem

Keyword: Property right regime, Lake governance, Lake history, Lake Rawapening, Indonesia

Technical Session 1: Biodiversity and Biological Resources

P1-1 PLANKTON COMMUNITY STRUCTURE IN SAGULING DAM

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Saguling Dam is a semi natural man-made ecosystem which is located at Bandung District, West Java. For the time being, the characteristic of Saguling Dam is changing because of human activity, such as floating net cage (FNC) activity. FNCs on Saguling Dam increase organic waste level at Saguling Dam. This causes plankton communities to change around the FNCs on Saguling Dam. Plankton communities can be used as an aquatic biologic parameter. Aspects that were inspected are the composition, abundance, and diversity of plankton species. This research's goal is to compare plankton communities at 3 different state of FNC: dense, distant, and vacant; at three different lake depths: 0, 3, and 6 meter(s) below the surface. Plankton communities on each point of point sample is tested using Sorensen's index. This research's conclusion is that the diversity index at Saguling Lake is at medium level; the highest plankton abundance is at 3 meters depth, and the highest predominant genus for phytoplankton is *Trachelomonas* and for zooplankton is *Paradileptus*. Sorensen's index results show that there are similarities of plankton communities at several point samples.

Keyword: Saguling Dam, plankton biodiversity, Floating Net Cage, fisheries, organic waste

P1-2 MICROBIAL COMPETITION FOR ACETATE: AN IMPORTANT FACTOR TO MITIGATE METHANE EMISSION FROM SASA-INVADDED WETLAND SOILS

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Acetate is the most important precursor to CH₄ during anaerobic degradation of organic matters. Wetland soils are a significant source of atmospheric CH₄ and their invasion by *Sasa* results in the decrease of the CH₄ emission. However, the microbial interspecies competition for acetate is largely unknown. Here, we identified actively acetate-assimilating microorganisms by ultra-high-sensitivity rRNA-stable isotope probing with ¹³C-labeled acetate. The *Sasa*-invaded soil slurry was amended with ¹³C-acetate and incubated anaerobically. A gradual degradation of the acetate was accompanied with the production of CH₄ and CO₂ during the incubation. RNA was extracted from the slurries and density-separated by isopycnic centrifugation. Microbial communities in density fractions of rRNA were screened by high-throughput sequencing. *Methanosaeta* spp. were significantly labeled with the acetate ¹³C. Notably, 34 different species of Bacteria were identified as the active ¹³C-acetate assimilators. One of them was closely related to the dehalo-respiring *Dehalogenimonas* sp. The others were phylogenetically novel, exhibiting low sequence similarities (i.e., 77.8% – 92.5%) of 16S rRNA genes. The result of this study demonstrated that hitherto unidentified bacterial species significantly assimilated acetate, thereby being competitive with aceticlastic methanogens in the *Sasa*-invaded wetland soils.

Keyword: *Sasa*-invaded wetland soil, stable isotope probing, acetate, uncultured microorganism

P1-3 A NEW HYPOTHESIS FOR THE DECLINING CAUSE OF THE JAPANESE EEL

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A hypothesis to explain the cause of the decline in Japanese eel *Anguilla japonica* is proposed, based on the analysis of catch trends and information on environments downstream of the Tone River, which used to be the greatest fishing ground in Japan. It was evident that the Tone River used to contribute more than 80% of the total spawning. Spawning migration was inhibited by a water gate constructed in 1963, and by the complete closure in 1975. Based on this, a hypothesis was proposed, stating that the Japanese eel decline was caused by the inhibition of spawning and upstream migration of eels into lakes, which were used as habitats, due to the water resource development projects. Support for this hypothesis was obtained by examining the parent-child relationship and the influences of the project on catches in areas other than the gate.

Keyword: The Japanese Eel, Declining Cause, Parent-child Relationship, Water Resource Development, Water Gate

Technical Session 1: Biodiversity and Biological Resources

P1-4 DEVELOPMENT OF A METHOD FOR LOTUS VARIETY IDENTIFICATION AND VARIATION IN POLYPHENOL CONTENTS

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The edible rhizome of lotus (*Nelumbo nucifera*), which is called "renkon" in Japanese, is popular in East Asia. The "renkon" is a special product of coastal area of lake Kasumigaura and this region produce approximately half of the "renkon" in Japan. It is quite difficult to identify varieties of "renkon", because they are cultivated under water and propagated vegetatively. Therefore, we developed a method for lotus-variety identification. First, we explored SNPs from lotus genome sequence, designed primers, and got about two hundred DNA markers. We examined about fifty varieties using High-Resolution Melting (HRM) analysis. Then we can distinguish them down to about twenty-five genotypes with only six selected DNA markers. In addition, we also examined polyphenol content in about fifty plus varieties of ornamental lotus derived from the lotus collection of the university of Tokyo, to select high polyphenol content varieties for future utilization in breeding program. First, polyphenol was extract from dried powder of node and internodes with methanol, then total polyphenol content was assayed using colorimetric method with Folin Ciocalteu's reagent. As a result, ornamental lotus varieties have wider diversity of polyphenol content than "renkon" varieties. Thus, ornamental lotus varieties can be good materials for "renkon" breeding.

Keyword: Using living things, Agriculture, Food production, Lotus rhizome, DNA marker

P1-5 WATER QUALITY AND FISHERIES OF THE BUI DAM IN GHANA: FIVE YEARS AFTER IMPOUNDMENT

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CSIR Water Research Institute

Ghana has derived many useful benefits from reservoirs including hydroelectric power generation, potable water supply, fisheries, irrigation, transportation and raw water supply for domestic, industrial and agricultural use. The Bui Dam is the third to be created in the Volta River System for hydroelectric power generation after the Akosombo and Kpong dams and has a surface area of 444 km². The study is the first assessment of the water quality and fisheries of the Bui Reservoir five years after impoundment. Field visits were undertaken between October and December 2016. Profiles of pH, temperature, dissolved oxygen, chlorophyll-a and turbidity were measured *in situ* using the YSI EXO II Sonde. Total Nitrogen and Total Phosphorus were determined using the Hach digestive methods. The fishery assessment was undertaken using a battery of multifilament and monofilament gill nets of laterally stretched mesh sizes of 12.5 mm - 40.0 mm and 38.1 mm - 177.8 mm respectively. The water quality profile assessment showed that the reservoir was thermally stratified. Mean temperature difference between surface and bottom water was 4.5° C. The water quality in the epilimnion was distinctly varied from that in the hypolimnion in relation to the physical parameters and chlorophyll-a but the nutrients showed minimal variation in concentrations between the surface and bottom water. The fisheries assessment revealed a decline in fish species composition by 57 % and a shift from riverine to lacustrine species as well as a shift in trophic dominance from piscivores to benthic omnivores when compared to the pre-impoundment results.

Keyword: Water quality, Fisheries, Dams and reservoirs, biodiversity, Ecosystems

P1-6 COMPARISON OF ENVIRONMENTAL CONDITION USING BIOLOGICAL INDICATORS IN YATSU TIDAL FLAT LOCATING IN TOKYO INNER BAY

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From the water quality of the Yatsu Tidal Flat (Funadamari/ Sankaku Tidal Flat), we aimed at to consider to about environment transition of the characteristics of water quality and pollution load factor of Yatsu tidal flat from the results of the water quality. And from the appearance situation of benthos organisms and attached diatoms. Characteristics of the water quality of the Yatsu Tidal Flat Characteristics of the water quality of the Yatsu Tidal Flat were estimated as being polluted progressing because high COD value in Funadamari and Daisankaku 2 and 3 were high. This is thought to be caused by weak flow than other site. T-P of Shosankaku is high because domestic wastewater was flowing in there. As water quality analysts, COD of Sankaku tidal flats (2.4mg/l) was almost similar to that of Tokyo Bay (2.7mg/l). From the results of benthic organisms overall the Funadamari is often evaluated as somewhat dirty in the degree of environmental preservation 2, and Sankaku Tidal Flat is evaluated as somewhat clean in the degree of environmental preservation 3. The results of DAIPo show that the value of DAIPo decreased in the Funadamari 4 from spring to autumn, but the value of DAIPo rose due to the increase in the number of saproxenous in other points. The Funadamari which is the most inner part of the Yatsu Tidal Flat shows the past figure of Yatsu Tidal Flat and the Sankaku Tidal Flat near Tokyo Bay shows the future of Yatsu Tidal Flat.

Keyword: Yatsu Tidal Flat, Environmental conditions, Green tide, Biological index, Water quality

Technical Session 1: Biodiversity and Biological Resources

P1-7 DIVERSITY MODELS OF PLANKTON IN GOLD COAST ORNAMENTAL LAKE, PANTAI INDAH KAPUK, NORTH JAKARTA

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Plankton diversity can be calculated through a model of species abundance. This study aimed to describe the structure of plankton communities using various models of diversity and coherence of the water quality. The study was conducted from July to December 2015, using the method of APHA, 2012. Based on water quality data, the five stations are grouped into three zones. Zone 1 consists of Station 1, Zone 2 consists of stations 2, 3, and 5, Zone 3 consists of Station 4. The difference in the water quality at each station causes differences plankton diversity. The results showed that the model of geometric and broken stick was not suitable for use in all zones. Log normal model was appropriate using in Zone 1 for data phytoplankton and zooplankton all zones to the data. Log series model was an appropriate model to describe the plankton communities throughout the zone. This model describes the waters were disturbed and their dominance.

Keyword: abundances models, plankton, Gold Coast Ornamental Lake, water quality

P1-8 ANTIFUNGAL ACTIVITY OF ACTINOMYCETES ISOLATED FROM SURFACE SEDIMENTS OF LAKE LANAO AGAINST *CANDIDA ALBICANS* AND *ASPERGILLUS NIGER*

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Antibiotic resistance is not only a national problem but a global dilemma. There are many reasons why this type of resistance exists including the lack of new antibiotics for older antibiotics are rapidly becoming ineffective. Thus, this study was conducted to determine if the isolated actinomycetes exhibits antifungal activity against two test organisms: *Candida albicans* and *Aspergillus niger*. A total of 34 isolated actinomycetes from the western part of Lake Lanao was obtained from the Microbiology Laboratory of the Biology Department. Potato Dextrose Agar (PDA) was the growth medium used for the test organisms while Nutrient Broth was the growth medium used for the isolated actinomycetes. Results showed that out of the 34 isolated actinomycetes, there were only eight (23.53%) potent, bioactive actinomycetes that inhibited the growth of *Candida albicans* by the mean of its zone of inhibition greater than the positive control. These actinomycetes, with their corresponding mean values, were A3 (26.39 mm), A9 (21.83 mm), A11 (22.66 mm), A18 (26.63 mm), A21 (24.74 mm), A25 (22.76 mm), A31 (14.76 mm) and A32 (16.88 mm). Whereas, only two (5.88%) of the isolated actinomycetes inhibited the growth of *Aspergillus niger* by the mean of its zone of inhibition greater than the positive control. These potent actinomycetes, with their corresponding mean values, were A11 (23.83 mm) and A31 (30.13 mm). With the results obtained from this study, the search for new and effective drugs may hopefully be attained.

Keyword: Actinomycetes, Antifungal activity, Lake Lanao

P1-9 ENVIRONMENTAL IMPACT RISK ASSESSMENT OF ALIEN SPECIES USING MICROCOSM SYSTEM

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From the biota (structural parameter) and the P/R ratio (functional parameter), utilizing the microcosm, which is a microbial ecosystem capable of constructing the basic ecological structure of general lakes, *Daphnia* (*Moina macrocopa*, the top-level predator species in the food chain) and bacteria (*Escherichia coli*, the lowest-level prey species in the food chain) as foreign species invading from outside the lake ecosystem and conducted ecological risk assessment. When introducing the top-level predator species in the food chain into the microcosm, there would be a risk that existing top-level predators would increase due to invasion of foreign organisms that would become higher predator. When introducing the lowest-level prey species in the food chain, it was evaluated that there would be no major impact on existing ecosystems. The influence of alien species on existing ecosystem depends on which trophic stage the alien species are located, and the influence on existing ecosystem is shown to be stronger in high-level predator species in food chain more than low-level prey species in food chain.

Keyword: alien species, environmental impact risk assessment, microcosm, prey-predator interaction, food chain

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P1-10 BIOLOGICAL EVALUATION METHOD FOR WATER QUALITY ENVIRONMENT IN THE KUJI RIVER BASIN USING AMPHIPODA (CRUSTACEA)

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As a result of a water quality survey in the Kuji River basin and a habitat survey of the amphipods (Crustacea) therein, amphipods were collected at 5 sites in lower and middle reaches of slightly polluted water. The results indicated that the amphipods found were unlikely to suitable indicator organisms for clean water. On identifying the species of the amphipods, it was found that a non-native, invasive alien species *Crangonyx floridanus* (Bousfield 1963) occurred in 4 sites of the research area. *Jesogammarus (J.) spinopalpus* (Morino 1985) found in the remaining one site is a species abundant in lowland rivers and lakes in the Kanto region. Survey in the upper stream area revealed *Jesogammarus (J.) paucisetulosus* (Morino 1984), which inhabits streams in the mountains in the Kanto, Hokuriku, and Tohoku districts. By identifying the species of the amphipods, we now have a method for biological evaluation of the water quality environment in the Kuji River basin. This will provide a useful indicator for ecosystem management in the future.

Keyword: amphipods, indicator organism, invasive alien species, ecosystem management

P1-11 DISTRIBUTION OF PHYTOPLANKTON AND WATER QUALITY IN CHIANG MAI MOAT, THAILAND

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The distribution of phytoplankton and the water quality of the Chiang Mai Moat, Thailand were investigated over a period of 4 months (September-December 2017). Samples were collected from 4 sites within the Chiang Mai Moat. The distribution of phytoplankton was found to be of the highest abundance at the Chang Phueak Gate site with thirty-nine species found, while the most abundant species were *Chlamydomonas* sp., *Trachelomonas* sp. and *Microcystis* sp. Thirty-four species were identified at the Suan Dok Gate site and the most abundant species were *Lepocinlis* sp. and *Trachelomonas* sp. Thirty-two species were identified at the Tha Phae Gate site and the most abundant species were *Aulacoseira granalata*, *Pediastrum biradiatum* and *Merismopedia* sp. Twenty-five species were identified at the Chiang Mai Gate site and the most abundant species were *Pseudanabaena* sp., and *Peridinium* sp., respectively. In addition, the trophic status of the Chiang Mai Moat was classified as meso-eutrophic status.

Keyword: Biodiversity, Chiang Mai Moat, Phytoplankton, Water Quality

P1-12 BIODIVERSITY ASSESSMENT IN AND AROUND THE MUSEUM LAKE IN GOVT. BOTANICAL GARDEN AND MUSEUM, THIRUVANANTHAPURAM INDIA

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Lakes perform several hydrological, biological, biogeochemical and other ecological functions both at ecosystem and landscape level with high aesthetic values. They significantly influence the microclimate and thereby influence the biodiversity in that aquatic ecosystem. An ecological survey carried out on the riparian flora and fauna around the Museum Lake recorded sixty bird species, thirty seven butterflies, twelve Odonates, forty six varieties of plants, five fish species, six varieties of reptiles and two varieties of amphibians. As urbanization is making depletion of the natural habitats, this *ex situ* conserved area well nourished with exotic and indigenous floras and perennial water body inside provides shelter for diverse fauna. The survey results will help in highlighting the importance of this inland lake ecosystem and suggesting recommendations for the better conservation and management of the aquatic ecosystem as a whole.

Keyword: Biodiversity, Museum Lake, Avifauna, Ecosystem Health, India

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P1-13 DIVERSITY OF FISHES IN LAGUNA DE CAGAYAN LAKE, PHILIPPINES: STATUS AND CONSERVATION NEEDS

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Assessment of ichthyofauna and habitat stability of Laguna de Cagayan Lake is a pioneer study to document diversity and conservation towards sustainable ecosystem services. The study was conducted to characterize species composition, abundance, IUCN Red List status, and diversity of fishes caught in the lake from September, 2017 to March, 2018. Species composition revealed 1,714 individuals belonging to 14 species from 9 families. The dominant species *Trichopodus pectoralis* consisted 41.94% and the least 0.06% of the population is *Leiopotherapon plumbeus*, Family Osphronemidae dominated the catch followed by Cichlidae and Anguillidae. *Cyprinus carpio* VU is the only Red List species. But *Anguilla celebesensis*, *A. bicolor pacifica* and *Clarias macrocephalus* are NT fishes. Diversity T-test showed significant differences ($P < 0.05$) on fish abundance between two sites and species richness of Luga, Margalef Index $d = 1.77$ is higher than Bangalao $d = 1.34$. Shannon-Weiner index $H = 1.59$ revealed that the lake is fairly stable. Simpson's Reciprocal Index showed $1/D = 3.34 - 4.29$ means there are 3-4 commonly caught species and suggest good result of the study. Pielou's Evenness ($J = 0.69$) observed more equal distribution of individual. Furthermore, Sorensen's Index $C_s = 2.67$ showed more than half of the fishes identified in both sites are of the same species. Results of this study could serve as a baseline data in coordination with concerned line agencies to formulate sound-community based management strategy.

Keyword: biodiversity evaluation

P1-14 BIRD ABUNDANCE IN THE RICE FIELDS OF CHOR-LAE COMMUNITY, MAE RIM DISTRICT, CHIANG MAI PROVINCE IN THAILAND

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The objective of this study was to investigate the abundance of birds in the rice fields and its surroundings during farming season. The survey was conducted from September to December 2016, by using the line transect technique along the rice fields. Data were collected from 0600 h to 0900 h and/or 1500 h to 1800 h, 16 times in total. Overall, seven orders consisting of 45 species within 24 families of birds were found. Thirty-two species were resident birds and 13 species were migratory birds. Passeriformes was the most common order of birds found in the area. Twelve bird species were categorized as abundant, for instance, Common Myna (*Acridotheres tristis*), White-vented Myna (*Acridotheres grandis*), Spotted Dove (*Streptopelia chinensis*), Rock Pigeon (*Columba livia*) and Eurasian Tree Sparrow (*Passer montanus*). Seven species were common; for example, White-breasted Waterhen (*Amaurornis phoenicurus*) and White Wagtail (*Motacilla alba*). Thirteen species were moderately common, such as Bronzed Drongo (*Dicrurus aeneus*). Other 13 species were uncommon, such as White-throated Kingfisher (*Halcyon smyrnensis*) and Intermediate Egret (*Mesophoyx intermedia*). The Shannon diversity index was 3.16 and the evenness index was 0.88. The data from this research will be useful for those interested in studying birds in the rice fields, wetlands or fresh water sources, and it would build good source of knowledge for community for planning conservation of natural resources in the future.

Keyword: Biodiversity evaluation, Bird abundance, Wetlands, Rice fields

P1-15 FEED STUDIES ON INGESTIVE BEHAVIOR AND FOOD OF THE JUVENILE MUSSEL (BIVALVIA: UNIONIDAE) AFTER FALLING OFF IN LAKE ANENUMA, AOMORI PREFECTURE

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Unionidae are widely distributed throughout the world, and 15 species and 1 subspecies have been documented in Japan. In recent years, 11 species are in danger of extinction in Japan due to the deterioration of environment in lakes. Therefore, as a part of studies to conserve *Unionidae*, we aimed to better understand the foods that is necessary for juvenile to grow after fall out, and their ingestive behavior. Juvenile mussels were collected from their host fishes, and grown on sediments with differently prepared biofilm. We found that growing amount became larger when biofilm was served as a food source. This positive effect was also observed when dried biofilm was fed. Furthermore, we observed with a digital microscope the existence of cilia on their feet and digestive tract, and using which foot palp-feeding was conducted and water flow was generated to feed. These results suggested juvenile of *Unionidae* feed biofilm by foot palp-feeding.

Keyword: Biodiversity evaluation, Ecosystem function, Endangered species

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P1-16 BIODIVERSITY EVALUATION USING NATURE INDEX TOOL IN CHILIKA LAKE, ODISHA, INDIA - A CASE STUDY

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Biodiversity is crucial for human well-being; it provides food, nutritional, ecological, economic and livelihood security. In 2010, parties to the Convention on Biological Diversity (CBD) adopted the Strategic Plan for Biodiversity 2011-2020, a ten year framework for action by all the countries to safeguard biodiversity and halt biodiversity loss. A pilot study was carried out in Chilika Lake for evaluating the status of biodiversity using the **Nature Index (NI)** tool developed by the Norwegian Institute for Nature Research (NINA). Chilika is one of the largest lagoons in Asia. This is the first Ramsar site of India and boasts a rich floral and faunal diversity. For evaluating the biodiversity status, 25 indicator species were selected from Chilika (15 fish & 10 birds) and the time series data of these indicator species were fed into the NI database. The NI values were calculated using the R-package and the status of biodiversity was visualised through a colour coded map (e.g. red-very poor; orange, yellow and green-gradual improvement; and blue-good). NI is a well-designed policy tool that synthesises biodiversity data and helps in monitoring the status of biodiversity. This monitoring tool can be used for identifying the threat status of a species/ecosystem and guides policy makers to take important policy measures towards preventing the loss of biodiversity. The outcome of the study will be presented during the conference.

Keyword: Biodiversity evaluation, Ecosystem services

P1-17 TERRESTRIAL AND FRESHWATER MOLLUSKS ON THE UNIVERSITY OF TSUKUBA CAMPUS

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Terrestrial and freshwater mollusks comprise one of the most diverse groups of animals. The mollusks are generally known as good ecological indicators and, because they are slow-moving and easy to observe, they have great potential for use in education. To describe the species composition and diversity, we surveyed terrestrial and freshwater mollusks on the University of Tsukuba campus in Ibaraki Prefecture, Japan. Between May 2017 and April 2018, we recorded 22 terrestrial and five freshwater molluscan species in 15 surveys at 28 sites. Commonly observed species were *Euhadra brandtii brandtii* (local name, Hitachimaimai), *Zonitoides arboreus* (Kohakugai), and *Acusta despecta sieboldiana* (Usukawamaimai) in terrestrial ecosystems and *Pseudosuccinea columella* (Habutaemonoaragai) and *Physa acuta* (Sakamakigai) in freshwater ones. Introduced species were also observed: six were terrestrial and two were freshwater species, accounting for about 30% of the total recorded species. The molluscan species are threatened globally by anthropogenic disturbances. Our results will be used for science and environmental education, management of introduced species and identification of important areas for biodiversity conservation.

Keyword: biodiversity evaluation, introduced species, nature conservation, education

P1-18 ISOLATION, SCREENING, AND IDENTIFICATION OF POTENTIAL ANTIBIOTIC-PRODUCING FUNGI FROM SURFACE SEDIMENTS OF LAKE LANAO, PHILIPPINES

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To keep abreast with the need to discover new antibiotics and help address problem on antibiotic-resistance, this study was conducted to isolate, screen, and identify potential antibiotic-producing fungi from Lake Lanao along Ditsaan Ramin, Taraka, and Marawi City, Lanao del Sur, Philippines. Isolation of fungi from sediment samples followed Serial Dilution Pour Plate Method resulting to the isolation of 126 kinds of fungi based on colony, hyphae and reproductive spores in slide cultures. Antibiotic screening was done using Cotton Swabbing Technique which showed 10 (7.94%) isolates with antibiosis activity based on the zone of inhibition (ZOI) around each fungal isolate against *Escherichia coli* and *Staphylococcus aureus*. *Acremonium* sp., *Pestalotia* sp. 1, *Sporotrichum* sp., and *Cladosporium* sp. inhibited both test bacteria with average ZOI of inhibition of 2-17.5 mm. *Pestalotia* sp. 2, *Scopulariopsis* sp., and *Aspergillus* sp. 2 inhibited *S. aureus* only whereas *Curvularia* sp., *Aspergillus* sp. 1, and *Penicillium* sp. inhibited *E. coli* only with 7-9.5 mm and 2.75-6.25 mm average zone of inhibition, respectively. The fungal isolates will be further tested against other pathogens and their antibiotics produced will be later purified and utilized for drug development, thus, could be of economic and medical importance.

Keyword: biological resource use, biodiversity evaluation, ecosystem services, lake ecosystems functions, wise use and development of water resources

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P1-19 EVALUATION OF RIVER ENVIRONMENT BY BIOLOGICAL INDICATORS IN BOSO PENINSULA

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In this study, rivers that flow down the Boso peninsula using biological indicators for river environmental assessment was conducted, and river environment map in the Boso peninsula drew up at the same time, aimed at the construction of biological environment information in Chiba Prefecture. The Boso peninsula is shown to be divided into three areas in the Northwestern (urban area), Northeastern (plains) and Southern parts (hilly area). The Northwest (urban area) and the Northeast (plains) were estimated as "dirty" and the South (hilly area) was estimated as "clean". In addition, there is the great gap on biotic assessment between benthos and attached diatom. In the future, traditionally from individuals, populations and water quality assessment and environmental assessment environmental DNA analysis be conducted from biological habitat quality and quantity and ecosystem composition, structure and functions point of view. Furthermore, development of the database is expected to the characteristics of environment information for ecosystem restoration and conservation by linking with evaluation based on sensibility such as Water Environmental Soundness Index.

Keyword: biological index, attached diatom, benthos, water quality, Boso peninsula

P1-20 THE DIVERSITY OF PHYTOPLANKTON IN SOME CHECK DAMS OF CHIANG MAI PROVINCE

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The study aims to explore the diversity of phytoplankton and their relationships with some environment parameters such as physical and chemistry properties. Ten different type check dams in Chiang Mai province were selected. The results showed that 5 divisions of phytoplankton were found including Bacillariophyta (66%), Chlorophyta (28%), Cyanophyta (3%), Euglenophyta (2%) and Chrysophyta (1%) respectively. The phytoplankton diversity and their abundance were able to reflex the environments varieties. Not only the physical and Chemical parameter that impacted to the check dams but the other factors such as season variation, type and the volume size of check dams were also influence to the distribution of phytoplankton

Keyword: Diversity, Phytoplankton, Check Dams

P1-21 A BRIEF INTRODUCTION OF BIODIVERSITY IN DONGTING LAKE

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Dongting Lake, the second largest freshwater lake in China, locates in the northern Hunan Province and connects to the Yangtze River. The lake has three Ramsar wetlands of international importance and shows rich biodiversity.

The vegetation in Dongting Lake composes by 229 seed plants belong to 58 families and 150 genera. Among these plants, 97% of species belongs to herbs. However, the number of the invasive plants reaches 43 species, belong to 34 genera and 19 families. The most typical invasive plant in the Dongting Lake is poplar plantations and their effects on the native plant diversity were investigated. On the whole, large-area of poplar plantations increased species richness and diversity index. However, they changed the species composition and decrease the number of aquatic species and native species. Therefore, biodiversity protection must be enhanced in the Dongting Lake wetlands.

Keyword: Dongting Lake, Biodiversity, Invasive plants, poplar pantation

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P1-22 DO WINTER-FLOODED PADDIES SERVE AS OVERWINTERING SITES FOR AQUATIC ANIMAL COMMUNITIES?

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For successful reintroduction of storks, winter-flooded rice cultivation has been introduced widely in paddy fields in the Toyooka Basin of the Hyogo prefecture, Japan. We studied the overwintering status of aquatic animal communities in winter-flooded paddies (WFP). The number of taxa of aquatic animals in winter-flooded paddies did not differ from that of conventional water management paddies (CWMP), fallow-field biotopes (FFB), and canal-type biotopes (CTB). Aquatic animals were more abundant in CWMP than in WEP. In addition, community structures of Odonata, Hemiptera, and Coleoptera were roughly divided into CWMP and WFP, and FFB and CTB, respectively. Our results show that winter-flooded rice cultivation is not very effective for the overwintering of aquatic animals, compared with conventional paddies and fallow-field biotopes. Therefore, it may be necessary to develop various types of overwintering environments at the regional scale in paddy fields for conservation of the aquatic animal communities.

Keyword: eco-friendly rice paddy, biodiversity, winter-flooded rice cultivation, aquatic animal community

P1-23 ESTIMATION OF ECOLOGICAL CARRYING CAPACITY OF TILAPIA (OREOCHROMIS NILOTICUS) CAGE CULTURE IN LAKE VOLTA USING PHOSPHORUS MASS BALANCE

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Development of intensive fish cage farming in reservoirs and lakes could pose threats to the environment. Ecological carrying capacity assessment is useful for sustainable aquaculture production and rational use of water bodies. The current study estimated the ecological carrying capacity for a tilapia cage culture on Lake Volta. The ecological carrying capacity was predicted using Dillon and Rigler mass balance model, taking into account water quality data and average production data of feed and fish compositions and feed conversion ratio (FCR). The phosphorus load to the environment estimated per tonne of fish produced was 22.77 kg P t⁻¹ for the farm. The calculated capacity was 6,363 ty⁻¹ for the farm area. The estimated capacity was about 14 times higher than the present production (450 ty⁻¹) in the zone. This suggests that further cage culture of tilapia could be established in the lake without compromising the water quality and the ecosystem. However, monitoring of water quality should be undertaken periodically to accurately determine the state of the lake in order to both confirm and refine predictions.

Keyword: ECOLOGICAL CARRYING CAPACITY, PHOSPHORUS MASS BALANCE, CAGE FISH FARM, LAKE VOLTA, TILAPIA

P1-24 HABITAT EVALUATION PROCEDURE OF UNIONIDAE IN ANENUMA-LAKE, AOMORI PREFECTURE, JAPAN

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Unionidae have many ecological functions which play an important role for aquatic ecosystem. For examples, their shell are used for spawning grounds of fishes, and they supply habitats and hiding places for fishes. In addition, they maintain water quality. Fifteen species of Unionidae inhabit in Japan, among which eleven species are listed on Red-data-book edited by the Ministry of the Environment in Japan. Therefore, conservation of Unionidae is urgent, and for that, it is important to better understand the environment where they inhabit abundantly. In this study we investigate Anenuma-lake in Aomori, the northernmost part of the main island of Japan. We evaluated the environment of habitat where *Hyriopsis Schlegeli*, *Inversunio jokohamensis*, and *Sinanodonta* spp. were distributed. Habitat distribution of the three species of Unionid mussels in Anenuma-lake was successfully explained by the habitat distribution model, created using habitat evaluation procedure (HEP). This method is expected to be applicable for the habitat evaluation of the Unnionidae in other lakes. The target variable, and the explanatory variable was the indispensable conditions for survival (depth, DO, chlorophyll a, distance from *Phragmites australis* belt, sediment grain size).

Keyword: Ecological function, Biodiversity Assessment, Endangered species

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P1-25 RELATIONSHIP BETWEEN APPEARANCE OF WILD MAMMALS AND LAND COVER IN URBAN AND PERI-URBAN ENVIRONMENTS: ANALYSIS OF ROAD KILL DATA IN TSUKUBA

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In urban and peri-urban environments, it is thought that habitats of wild mammals are limited. So to clarify environmental features in there are very important for biodiversity conservation. Therefore, in this study, we focus on the feature of "inland water" as the one classification of land cover. Inland water environment such as rivers and lakes is assumed to be a suitable habitats for wild mammals in urban and peri-urban environments and we tried to verify it. For that purpose, we analyze the relationship between appearance of wild mammals and land cover, taking examples of Tsukuba city, Ibaraki prefecture. We interpret road-kill data as appearance of wild mammals, 357 records of raccoons, weasels, rabbits, raccoon dogs and masked palm civet. And we use the National Land Numerical Information as land cover data. From GIS analyzing, we clarify the distance from each point of appearance to the land cover (forest areas, agricultural areas, urban areas, and inland water).

Keyword: Ecological Network, Ecosystem Management, GIS, Road-kill

P1-26 AQUATIC ECOSYSTEM SERVICE PERCEPTIONAL PROFILE ASSESSMENT: FOCUS ON REGULATING SERVICES AND IMPACT TO HUMAN HEALTH IN BALOI LAKE, BALOI, LANA DEL NORTE (PHILIPPINES)

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This study was conducted to probe the stakeholders' perception of stress exerted to the regulating services provided by Baloi Lake and its impact to the respondents' health employing structured interview technique. Study results showed that most of the respondents are young (65%), having blue collar job (fisherman or unemployed), and an old time resident in the area (15 to above 25 years residency). They have low weekly income (65%), who reached high school level, or high school graduate (62.50%), and residing near the lake shore (57.50%). Most respondents perceived regulating services (biodiversity, food chain, plant and animal habitats, climate moderation, pollution absorption by wetlands, and drought mitigation) as degraded. However, these environmental degradations were not affecting them, their families, and the municipality. There existed a direct relationship between the perception of the respondents' residency years in the municipality and the pollution absorption by wetland. Also, a direct relationship is observed between the respondents' health impact and the distance of their residence from the lakeshore.

Keyword: Ecological stress, Aquatic ecosystem, Regulating services, Health impact

P1-27 COMPARISON OF FOOD HABITS, BODY SHAPE AND GROWTH ON NATIVE PISCIVOROUS FISH, *OPSARIICHTHYS UNCIROSTRIS UNCIROSTRIS*, IN LAKE BIWA BETWEEN 1960S AND 2010S

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I reviewed and compared previous studies on native piscivorous fish, three-lips (*Opsariichthys uncirostris uncirostris*), in Lake Biwa, conducted in 1960s and 2010s, for examining effects of ecosystem changes on the population in the lake after 1970s. I compared food habits, length-weight relationships and growth of the fish species between the two studied periods. For the food habits, predations on small cyprinid and gobiid preys by the three-lips declined in 2010s, compared to the results from 1960s, while the three-lips were mainly piscivorous between the two studied periods. Length-weight relationships in adult females observed in 2010s were smaller than those in 1960s. The fishes that were 3-years and older observed in 2010s were shorter in standard length than those in 1960s. In conclusion, I found that changes in food items and downsizing in body shapes and lengths of adult fishes in the three-lips population in Lake Biwa were observed between 1960s and 2010s. I suggest that changes in fish fauna, due to destruction of littoral areas and invasions of non-native predatory fishes after 1970s, may have affected ecology of the three-lips.

Keyword: endangered species

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P1-28 ENVIRONMENTAL CONDITION, DISTRIBUTION, AND STRUCTURE OF AQUATIC PLANT COMMUNITIES OF THE RIVERS AND IRRIGATION CHANNELS AROUND THE LAKE SUWA, NAGANO PREFECTURE, CENTRAL JAPAN

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Latterly, the loss of biological diversity of aquatic plants has become an important issue by water pollution and development in the Lake Suwa. For the conservation of the aquatic plant communities, it was necessary to grasp the condition of the rivers and irrigation channels around this lake, but there was little knowledge. Therefore, the purpose of this study was to know the environmental condition, distribution, and structure of aquatic plant communities of the rivers and irrigation channels around this lake to conserve particularly these endangered species. We chose two investigation areas from the northern part and the southern part of the lake. Vegetation and environmental conditions of the riverside communities were investigated in 2015. All investigation plots were 661, and the area of one quadrat was 1square meters. The dominance of the appearance species in each plot were measured. And, the environmental conditions were measured and recorded as follows; water quality, agricultural and dredging managements and so on. Furthermore, we carried out hearing investigation about the management situation. All of the number of appearance species was 75. Particularly, the number of endangered species was 17. Eleven types of communities were distinguished by a TWINSpan classification. These were primarily classified into three river types, four spring water types, and four lowland weed types. The environmental condition such as quality of bottom or the quality of the water was different in the northern part and the southern part of the lake. It was thought that they influenced difference in species composition.

Keyword: endangered species, invasive alien species, aquatic plant, Lake Suwa, irrigation channel

P1-29 FISHING GROUNDS AND CLOSED FISHING AREAS OF LAKE BARINGO, KENYA

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A monthly sampling exercise was carried out twice in February-June 2011 and February-April 2012 in Lake Baringo to identify and map the fishing, breeding and nursery grounds. The ultimate goal was to set aside closed fishing areas for fish breeding and wildlife conservation, thus enhancing sustainable management and mitigate conflicts in the lake. Fishing grounds were identified by visiting the sites where fishing gears had been set and establishing the geographical positions where gears were set using a GPS.

In the southern zone of lake there were three major fishing grounds during the 2011 sampling period. These were: i) along the eastern shoreline of lake between the mouths of Rivers Ngasotok and Molo, ii) along the western shoreline between the mouths of Rivers Perkerra and Kapthurin and iii) there area between Lesukut Island and mouth of River Ngasotok. During the same period, fishing ground in the central zone was identified around Kampi ya Samaki, Kokwa and Samatiany islands towards the north. In the northern zone, fishing grounds was located between Rongena Island and Komolion.

During the high lake water level (2012), there was a substantial geographical migration of the fishermen particularly to the intermittent lake and areas which were hitherto land. The geographical migration of the fishermen was probably motivated by migration of fish in large numbers to the intermittent lake. The fact that some fishing grounds fall within the legal closed fishing areas implies that enforcement of fisheries laws is not effective or is not being done at all.

Keyword: Fish resources maps, closed fishing areas, geographical migration

P1-30 FISH EMIGRATION FROM SMALL LAKES AND RELATED FACTORS

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Fish emigrations from lakes and factors influencing the movements were studied using one-way traps sited at the mouth of inflow channel for twelve farm ponds. It was the *Pseudorasbora parva* to which the highest number of emigrant was captured, and top five species, including *P. parva*, with high occurrence in the studied ponds were account for about 96% of all emigrants captured. There was a significant positive relationship between a shoreline alteration level (i.e. proportion of concrete bank) and the fish emigration, and the GLMM and the model averaging analysis showed that the shoreline alteration level was the major factor influencing the movement. Meanwhile, emigrations of planktivorous fish species tended to have positive association with a density of zooplankton in the inflow channel water. Our results indicate that the anthropogenic change in lakeshore environments could have a significant impact on the behavior of lake-dwelling fish species. It is also suggested that not only lake environments but also inflow environments could influence the fish emigration from lakes.

Keyword: Farm pond, Fish movement, Ecosystem network

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P1-31 NON-NATIVE CHANNEL CATFISH MODIFY SWIMMING MODE AND BUOYANCY BASED ON FLOW CONDITIONS

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Freshwater fish species that widely inhabit both lentic and lotic environments are thought to be able to adapt to fluctuating flow conditions in terms of locomotion. In adapting to the different functional demands of lentic and lotic habitats on fish energetics, physostomous (open swim bladder) fish may optimize their locomotion and activity by controlling their net buoyancy; however, few buoyancy studies have been conducted on physostomous fish in the wild. We deployed accelerometers on free-ranging channel catfish, *Ictalurus punctatus*, in both lentic (Lake Kasumigaura) and lotic (the Tone and the Yahagi River) habitats to quantify their swimming activity and to determine their buoyancy condition preferences in relation to flow conditions. Individual comparisons of swimming efforts between ascent and descent phases revealed that all fish in the lentic habitat had negative buoyancy. However, all lentic individuals showed many descents without gliding phases, which was contrary to the behavior predicted to minimize the cost of transport. The fact that significantly fewer gliding phases were observed in the lotic habitat, together with the existence of neutrally buoyant fish, indicated that channel catfish seem to optimize their locomotion through buoyancy control based on flow conditions. The buoyancy optimization of channel catfish relative to the flow conditions that they inhabit may reflect an adaptation to various freshwater environments.

Keyword: invasive alien species

P1-32 EFFECTS OF UPSTREAM RESERVOIR REGULATION ON THE INTRA-ANNUAL DISTRIBUTION OF BENTHIC INVERTEBRATES IN A LARGE FLOODPLAIN LAKE (DONGTING LAKE, CHINA)

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Hydrological controls from damming upstream heavily affect the flow-sediment regime and water chemistry of floodplain lakes downstream, and thus cause profound impacts on lake ecosystems, which have been widely proven. However, with this series of disturbances, the intra-annual distribution of benthic invertebrates may be affected but it is not clear by now. This research aims to explore benthic invertebrates (BI) response to hydrological process variation induced by upstream reservoir regulation, using three years (1995, 2004 and 2014. The Three Gorges Reservoir started operating in 2003) paired hydrological database and monitoring data of BI in Dongting Lake. The results showed that: the intra-annual distribution of BI significantly responded to upstream reservoir regulation, but this response was not sustained. Hydrological variation in dry season and in wet season seemed to have greater impacts on *Aquatic Insecta* while the variation in wet season has greater impacts on *Mollusca*. Sediment concentration and water chemistry were proven to be the critical variables. Sediment concentration was positively correlation with the intra-annual distribution of *Aquatic Insecta*. Flow and water level were closely related to *Mollusca* and *Oligochaeta*. Water chemistry was most closely related to *Other Taxa*. This work would provide valuable information for design of lake management strategies and upstream reservoir regulation rules.

Keyword: Intra-annual distribution, Benthic invertebrates, Upstream reservoir regulation, Dongting Lake, Three Gorges Reservoir

P1-33 ALIEN PLANT LUDWIGIA GRANDIFLORA SUBSP.GRANDIFLORA IS EXTERMINATED IN THE EMBRYONIC STAGE

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We confirmed for the first time in Lake Kasumigaura of Tsuchiura city by the National Census on River Environments carried out in FY2016, the Alien Plant *Ludwigia grandiflora* subsp.*grandiflora*. since it was thought that it will have a great influence on future river management,we carried out urgent removal work in cooperation with related organizations. The disinfection work was carried out with reference to the opinion of academics and experts and the current situation in Lake Biwa and the extermination activity,aiming for complete elimination before spilling out and diffusing.

Keyword: invasive alien species, *Ludwigia grandiflora* subsp.*Grandiflora*, management, Introduced species Damage Prevention Motion planning

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P1-34 THE PRESENT GROWTH AFTER THE REMOVAL OF *LUDWIGIA GRANDIFLORA* SUBSP. *GRANDIFLORA* (ONAGRACEAE) IN LAKE KASUMIGAURA, IBARAKI PREFECTURE, JAPAN

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In May 2017, the growth of *Ludwigia grandiflora* was observed in the drain and waterfront of Lake Kasumigaura in Ibaraki Prefecture. *Ludwigia grandiflora* is defined as Invasive Alien Species, which cause a problem in western Japan, but the record in eastern Japan is the first time. In August 2017, Ministry of Land, Infrastructure, Transport and Tourism and related organizations gathered and carried out the removal of this community. After this practice, we observed the status in September, October, November, January and April of the following year. As a result, some young individuals were found in the place where the practice was carried out. They are likely to have occurred from the cut of the root and shoot. Some of them grown by stolon and elongated. Although it has not been confirmed that the distribution has spread to wide area at the present time, we will continue the monitoring and the control work as necessary, and pay attention to expansion of the distribution of this species.

Keyword: Invasive Alien Species, Ecosystem Management, *Ludwigia grandiflora* subsp. *grandiflora*, Lake Kasumigaura, removal

P1-35 THE INVASIVE ALIEN SPECIES OF FRESHWATER CRAYFISH: ECOLOGICAL AND ECONOMICAL IMPACTS

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Bogor Agricultural University (IPB)

The presence of invasive alien species in freshwater ecosystems, such as freshwater crayfish, can give a significant influence to native species and humans. This study aims to confirm species, distribution, and impact of freshwater crayfish. The study was conducted in the lake, reservoir (artificial lake), and situ (small lake) in West Java area on May to October 2017 with survey methods and descriptive analysis. Morphologically, there are two invasive alien species of freshwater crayfish in West Java, namely *Cherax quadricarinatus* and *Procambarus clarkii*. *Cherax* has been widely distributed in inland waters of West Java region. *Cherax* has been found in all lakes in altitude < 1000 meters above sea level. Meanwhile, *P. clarkii* is only found in ornamental fish traders in Bogor, which is originated from cultivation activities in Sukabumi area. Ecologically, the presence of freshwater crayfish, especially *Cherax quadricarinatus*, has decreased the population of native species of small crustaceans, such as in Lake Lido, meanwhile, in other sites it has not occurred. During the study, there has never been any incidence of freshwater crayfish as a plague vector on human. Economically, the presence of both freshwater crayfish can give a positive impact to local people, both for consumption and ornamental fish.

Keyword: Invasive alien species (IAS), Biodiversity evaluation, Fisheries

P1-36 DEVELOPMENT OF MANAGEMENT METHOD FOR THE INVASIVE WATER PRIMROSE (*LUDWIGIA GRANDIFLORA*) IN LAKE BIWA

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Hiyoshi Corporation

Although the precise introduction route of the water primrose in Japan is still unknown, it was first recorded in Kasai city of Hyogo prefecture in 2007. And then it was found in Akanoi Bay, Lake Biwa in 2009. Water primrose has expanded rapidly and has become one of the most damaging invasive plants, currently extending to about 300,000 m². In the water, its dense stem becomes a habitat for mosquitoes; moreover, sediments accumulate and inhibit the flow of water. A number of physical measures have been used to control the expansion of the water primrose, including mechanical harvesters, rotovators, and hand removal, but results have largely been poor. In order to develop measures to counter the expansion of invasive alien aquatic plants in Lake Biwa the present project aimed to identify new techniques for the removal of aquatic plants and methods for suppressing the spread of effluent water from industries. The purpose of this project is to support the development of new technologies by subsidizing those adopted by Shiga prefecture. We applied the project program and adopted an herbicide management method for water primrose control. We used Basta® as an herbicide and its effects were tested using water primroses cultured in a plastic bucket, and as expected it was completely eliminated. In addition, acute toxicity tests for aquatic organisms were conducted using Medaka (*Oryzias latipes*), Daphnia (*Daphnia pulicaria*), and Honmoroko (*Gnathopogon caeruleus*) from Lake Biwa. High safety conditions were confirmed.

Keyword: invasive alien species, water primrose, *Ludwigia grandiflora*, herbicide, glufosinate

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P1-37 CHANGES OF FISH FAUNA IN RESPECT TO ENVIRONMENTAL CHANGES OF LAKE KASUMIGAURA AND ITS CONSERVATION

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Lake Kasumigaura has developed as a lagoon in the east part of Kanto Plain by sea level rise during the Jomon period. Its mouth part was gradually closed with accumulated sediment, and it changed into a fresh water lake by the end of the 17th century. During the 20th century when Japan was just in the economic development and modernization, the lake suffered from substantial changes for the prevention of flood and utilization of water for irrigation, industry and public purposes. To realize these purposes, a water gate was constructed on the Hitachigawa-river, connecting to the Pacific Ocean via the Tone-river. As a result, the flow of salt water into the lake was prevented and the lake water changed into full fresh water, and the disconnection restricted the passage of migratory fishes. Many migratory fishes, such as Japanese eel and Japanese seabass, decreased remarkably. However, some other fishes, such as smelt and icefish transformed their life mode into landlocked form, and now they can complete their life cycles without going down to the sea. Another structural change was brought by the construction of concrete walls surrounding whole lake shores. This gave serious damages to shore vegetation, resulting in the decrease of many shore-living fishes. Excessive eutrophication sometimes results in a lack of oxygen, which kills bivalves and decreases bitterlings. In addition, some invasive fishes, such as largemouth bass and channel catfish, have established widely in the lake, giving high predation pressure on small fishes. Lastly, some suggestions are given to conserve an appropriate fish fauna in Kasumigaura.

Keyword: Lake Kasumigaura, changes of lake environment, fish fauna and its conservation, nature restoration, invasive alien species (IAS)

P1-38 HABITAT STATUS OF *PROCAMBARUS CLARKII* IN A EUTROPHICATION-REGULATING PONDAGE

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Iwate Prefectural University

We investigated the habitat of *Procambarus clarkii*, which is an invasive alien species living in a constantly watered regulating pondage located in Takizawa City, Iwate Prefecture. From the result of a population estimation, the number of crayfish inhabiting the pond was estimated to be about 300 to 1,200 individuals. From a capture survey, it was confirmed that the species was distributed more toward the shallow places of this pond; the dissolved oxygen (DO) concentrations in the bottom layers of deep places tend to be lower due to eutrophication, making them a harsh environment for the crayfish, even though it is a benthic organism. Although egg-brooding individuals were not captured during the survey, the cement gland appeared in individuals on September 7 and larvae-holding individuals were observed on October 3; it is specified that the approximate spawning season of the crayfish in this pond is September. Henceforth, we will attempt to install traps in high frequency during the spawning season, in order to increase the effectiveness of extermination by capturing incubating individuals. Additionally, we would like to investigate the predation relationship in the pond, to clarify the ecological niche of the crayfish in an effort to find suitable management methods.

Keyword: invasive alien species (IAS), ecosystem management

P1-39 DAMAGE CAUSED BY *LIMNOPERNA FORTUNEI* AT THE WATER PURIFICATION PLANT AND COUNTERMEASURES

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Ibaraki Prefectural Public Enterprise Bureau

Limnoperna fortunei, a specific alien species, its existence was confirmed for the first time in Lake Kasumigaura in 2005. Ibaraki Prefectural Public Enterprise Bureau conducts a water supply project at 10 water purification plants, of which 6 water purification plants take Lake Kasumigaura water. The Kasumigaura water purification plant, which is one of these, takes Lake Kasumigaura Nishiura water. At the water intake facilities of this water purification plant, the bar screen is confirmed to be blocked by a mass of *Limnoperna fortunei* from 2016, and there is a possibility that it will be impossible to supply water with the planned amount of water. Therefore, at this water purification plant, we have taken countermeasures such as changing intake patterns and removing the blocked *Limnoperna fortunei* with the human power, so that we can supply water for stations steadily. Moreover, when we investigated the actual condition of *Limnoperna fortunei* in the water intake plants taking Lake Kasumigaura Nishiura or Kitaura, it was revealed that the number of occurrences of *Limnoperna fortunei* is smaller in Kitaura than in Nishiura.

Keyword: Invasive alien organisms

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P1-40 PRESENT STATE AND CONTROL OF SOME SPECIFIED INVASIVE ORGANISMS (PLANTS) ESTABLISHED IN AND AROUND LAKE KASUMIGAURA

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Nine plant species designated as specified invasive organisms have been established in Ibaraki Prefecture. Among those, *Gymnocolonis spilanthis* was first found in 2005 in Nishiura, main body of Lake Kasumigaura. This plant, together with *Alternanthera philoxeroides* and *Myriophyllum brasiliense*, explosively propagated in Shintonegawa waterway that flows into the lake. These plants were removed by Ibaraki Prefecture in 2011, but they grew again as before within several years in the same areas. Because of their high propagation ability, their spreading over Nishiura was easily expected. Therefore, based on the distribution surveys made in and around Kasumigaura from June 2016 to September 2017, their removal was again performed in Shintonegawa areas between 2017 and 2018. Considering extreme difficulty in the complete removal of once established invasive plants, more effective measures against extension of their distribution, re-propagation and invasion of newcomers should be developed.

Keyword: Lake Kasumigaura, invasive alien species (IAS), *Alternanthera philoxeroides*, *Gymnocolonis spilanthis*, *Myriophyllum brasiliense*

P1-41 ECOSYSTEM-LEVEL ASSESSMENT OF LIVING MICROBIAL PESTICIDES USING AQUATIC MICROCOSM SYSTEM

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Six species of microbial pesticides (*Bacillus thuringiensis* subsp. *aizawai*, *Bacillus thuringiensis* subsp. *kurstaki* and *Pseudomonas fluorescens* as bacterial pesticide, *Verticillium lecanii*, *Beauveria bassiana* and *Metarhizium anisopliae* as fungal pesticide) were assessed on ecosystem-level using gnotobiotic-type experimental aquatic microcosm system. As results, all microbial pesticides didn't increase in their population in microcosm where they were introduced, and finally be removed from the ecosystem site under biological interaction such as prey-predator interaction with indigenous microbiota. From the viewpoint of prevention of bio-diversity, it is an important problem to establish the test technique in detail for ecosystem impact risk assessment immediately, and to effectively use microbial pesticide and the DNA recombinant microorganism of which utilization expects the field of the bio-remediation as the beginning, the evaluation test technique using the microcosm system could be recognized to be one of the effective means.

Keyword: microbial pesticide, microcosm, ecosystem-level assessment, bio-diversity

P1-42 USE OF MACROINVERTEBRATE AS THE WATER QUALITY BIO-INDICATOR IN WANG RIVER AND CREATING A LEARNING GUIDE FOR ELEMENTARY STUDENTS

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Chiang Mai Rajabhat University

The study aims were to study the distribution of macroinvertebrate communities in Wang River. The macroinvertebrate samples were collected from 5 sampling sites along the Wang River from winter and summer season on January to June 2018. The macroinvertebrate diversity and abundance were higher in the upstream to the downstream. The diversity and abundance of macroinvertebrate were decreased from winter season to summer season due to the higher of chemical concentration in the river. The chemical and physical from human activities and seasonal were an influence factors to the macroinvertebrate community and could be used as a tool to monitor the water quality.

Keyword: Macroinvertebrate, Wang River, Water quality, Bio-indicator

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P1-43 SATOHAMA : HARMONIOUS COEXISTENCE OF HUMANS AND CREATURE

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Kasumigaura Citizens' Association

Kasumigaura Citizens' Association has been established in 1996 putting mind of the Lake Kasumigaura Declaration made in the 6th World Lake Conference in an idea. Concentrating citizens' wisdom that we cultivated in the partnership with citizens, administrations, researchers, and industries, we continue working on promotion, enlightenment of the quality of the water purification towards "the Swimmable Lake Kasumigaura". "Swimmable Lake Kasumigaura 2020 Citizens' Plan" includes more concrete plans in various fields such as life culture, waterside interchange, environmental preservation, ecosystem maintenance, history culture, regional economy, enlightenment, environmental learning. Especially lake shore maintenance is very important. We are practicing the SATOHAMA making project related to the beach reclamation on an ongoing basis. SATOHAMA is a created word that joined "Sato" where the person lived in to "Hama"(the beach) which nature made. We think that it promotes the interest of people for the Lake Kasumigaura and consciousness and an action to quality of the water purification by utilizing and maintaining SATOHAMA which connect the beach with people.

Keyword: nature restoration, ecosystem functions, riparian areas, community, community development

P1-44 LIVING WITH THE ORIENTAL WHITE STORKS ~THE CHALLENGE FOR TOYOOKA~

Yuto Oitsu

Toyooka Municipal Government, Division for coexistence with the Oriental White Stork

The project is to reintroduce the Oriental White Storks in Toyooka City. It is a unique and magnificent project in the world. To preserve a habitat of the Oriental White Storks which stands at the top of an ecological pyramid, the project to reintroduce the Oriental White Storks into the Wild is spreading through various fields. The Stork Friendly Farming Method nurtures good rice and various living creatures. It is the farming to aim to create rich culture, community and environment in which the stork can also live. Working on to preserve the Oriental White Storks habitat to create waterside environment which become the stork habitat and so on. Promoting the children who can inherit the reintroduction of the Oriental White Storks in the future. Nowadays, above a hundred storks fly grandly in the skies of Japan, not to mention Toyooka City. Toyooka City will continue on with the challenge as we aim for an ecologically and culturally harmonious future in which storks and people can live together.

Keyword: natural restoration, endangered species, service of ecosystem, evaluation of ecosystem

P1-45 CONCEPT OF EQUITY IN THE CONTEXT OF PROTECTED AREA MANAGEMENT AND ITS FUTURE ISSUES

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At the 10th Conference of the Parties to the Convention on Biological Diversity, the Aichi Target was adopted. Aichi Target 11 sets Targets for protected areas. Among them, indicator for evaluating "equitable management" only are missing in the Convention. However, research that proposes indicators to evaluate equitable management is increasing. Therefore, this paper, through review of recent research, summarized the points to consider. As a result, the three aspects related to equity have been subdivided into each, there are some quantitative indicators such as sharing the cost and benefits, and qualitative indicators such as decision making. It was also revealed that efforts towards equitable management are advanced in the Ramsar Convention. As a conclusion, it is expected as future issues that how Convention on Biological Diversity will cooperate with other Convention such as the World Heritage Convention and interaction of three aspects related to equity.

Keyword: Protected area, Equity, Aichi Target 11

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P1-46 ASSESSMENTS OF HEAVY METALS ÉLÉMENTS(NICKEL,ZINC,COPPER)POLLUTION IN AHÉMÉ LAKE IN BÉNIN WEST AFRICA

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This study focuses on the physical and chemical of heavy metals element and their impacts on Aheme lake.

Ahémé lake is located in subequatorial in Benin,west Africa.The lake joins river of Coufo and coastal lagoon of Ouidah in Mono-Couffo state in Benin.This lake is about 78.3km² surface areas and approximatively one millions of people rely on the Lake Aheme for domestic uses and agricultural purposes for rearing of livestock and especially for fishing.It is favourably good for tourism as well.

Tools such as spectrophotometers DR/2000 HACH,Atomic absorption spectrophotometry were used in the laboratory to evaluate concentration of heavy metals and to characterize some physical and chemical elements .

Results show high concentration values of Nickel,Zinc,Copper in the lake,despite the fact that these metals are essential for life at the trace level,it must be known that they become threat to the lake and all its ecosystems at well above permissible concentration.As far as the level of Aheme pollution is concerned for their pollution it is suspected food chain contamination by heavy metals with risk of bio accumulation on people through the chain.At present the incumbent government is laying all its emphasis on this area in order to bring out the best to regenerate disappearing aquatic ecosystems.

Keyword: pollution, heavy metals concentration, Aheme lake, physical and chemical, agricultural purposes and domestic

Technical Session 2: Sustainable Use of Freshwater Resources

P2-1 PRACTICAL ISSUES OF CLIMATE CHANGE ON WATER QUALITY PREDICTION FOR WATER QUALITY AND ECOSYSTEM IMPACT ASSESSMENT IN LAKE AND WATER QUALITY EVALUATION OF ADAPTATION MEASURES

Tadasu Yamada

Water Environment Division Environmental Management Bureau Ministry of the Environment

It is suggested that the impact of climate change on the water environment of lakes in Japan is evaluated as critical in the government's adaptation plan. However, the water quality change of lake has regional characteristics. So it is necessary of the detailed simulation etc. for each lake in order to grasp the specific impact. Therefore, the Ministry of the Environment selected three types of the model lake from the viewpoint of climate change as a whole circulation failure, eutrophication, change in snow melting, etc. Next, future weather conditions provided from the climate model were set. And by using those conditions, future water quality prediction was carried out using the water quality prediction model, and attempts were made to evaluate the change in lake water quality and the impact on the ecosystem. As a result, the following facts were found out. Firstly, the lake water quality change in future is large and it is necessary to use prediction results of multiple cases for impact assessment. Secondly, it is necessary to set appropriate evaluation items according to the lake characteristics. Thirdly, in extracting adaptation measures to reduce climate change impacts, it is necessary to consider that the adaptation measures separately according to the difference in occurrence frequency.

Keyword: climate change, lake, water quality prediction, ecosystem, adaptation measure

P2-2 DYNAMICS OF ANTHROPOGENIC ORGANIC MATTER BISPHENOL A ASSOCIATED WITH SALT LEVELS IN THE ESTUARY

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In an estuarine environment, it is thought that anthropogenic organic matter dissolved in river water concentrates and precipitates by salting out effect, but few examples of observation at the site are known. Therefore, in this study, we investigated the relationship between salinity and dynamics of bisphenol A (BPA) representing an anthropogenic organic compound in dissolved organic matter (DOM), particulate organic matter (POM) and sediments at Sagami River, Tokyo, Japan. The ratio of BPA concentration in DOM to that of BPA in POM showed a trend that sufficiently decreased with salinity of 5-10‰ implying BPA shifted from the DOM fraction to the POM fraction by the salinity effect. The location of the estuary that experiences this salinity range (5-10 ‰) was slightly upstream of the most estuary. Furthermore, a sediment sample having a salinity range of 5-10‰ as a mean value showed the highest concentration of BPA comparing with other sediment samples where have lower (< 5‰) or higher (< 10‰) salinity ranges. The concentration of BPA in sediment at that location was significantly higher than the concentration of upstream and downstream sediments. These results clearly indicate the salinity that effects the concentration and accumulation of anthropogenic organic compounds in an estuarine sediment.

Keyword: Contamination by chemical substances, Salinity effect, Estuary, Anthropogenic organic matter, Bisphenol A

P2-3 HISTORICAL CHANGE FROM FRESH WATER TO BRACKISH CONDITIONS IN LAKE SUIGETSU INFERRED FROM STEROL TRACERS

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Lake Suigetsu is a brackish lake where anoxic conditions were formed by constructions of irrigation canals beginning in the Edo period to prevent flooding damage. Sterols alter into stanols under anoxic conditions by bacterial reduction of double bond at a 5 position. Therefore, a proportion of stanol to sterol (stanol/sterol ratio) in geochemical sample show higher value under anoxic conditions. In this study, we investigated to reconstruct formative history of the anoxic conditions in Lake Suigetsu from the past to the present using stanol/sterol ratios recorded in the Lake Suigetsu sediment. Stanol/sterol ratios and farnesol (originating from green-sulfur bacteria) show a relatively high values from starting of the construction, implying that these tracers clearly recorded the past anoxic conditions. On the other hand, the highest values of the tracers were around the surface sediment, implying that the present anoxic conditions in Lake Suigetsu were formed after the most recently flood prevention work. These results agree that artificial activities contribute a factor to greatly change lacustrine environments.

Keyword: Lake Suigetsu, Brackish lake, Anoxic condition, Organic Geochemistry, Tracer

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P2-4 MONITORING INVESTIGATION OF REDUCTION IN SEDIMENT INTRUSION IN KUSHIRO WETLAND

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The Kushiro Wetland is the largest wetland in Japan and is located in the lower reaches of the Kushiro River. As the wetland area was greatly reduced due to development for residential and firm land, the wetland restoration project commenced. The sediment storage area was constructed in Kuchoro River and old channel restoration was implemented in Kayanuma district in Kushiro River, they were intended to reduce sediment intrusion into central wetland area. The volumes of sediment transport in the flow and deposition have been monitored at each site. Approximately 10% of suspended loads during flood periods were deposited in the storage area at the site of Kuchoro, 50% of the flood water was inundated and 70-90% of suspended loads were deposited in the inundated area.

Keyword: effects of sediment, monitoring technologies for lakes and/or rivers

P2-5 UNDERSTANDING OF GROUNDWATER POLLUTION ACTUAL CONDITION SURVEY RESULTS AND MEASURES TO PREVENT GROUNDWATER CONTAMINATION

Shingo Kuki, Yasunori Nakahori

Office for Groundwater and Ground Environment Environmental Management Bureau Ministry of the Environment.

The Ministry of the Environment conducts nationwide surveys every fiscal year on groundwater pollution cases in cooperation with the local governments. According to the survey results in the FY2016, many pollution cases such as VOC, heavy metal, and combined pollution were thought to be caused by factories and workplaces or natural factors. In order to prevent groundwater pollution from factories and workplaces, the Water Pollution Control Act was revised in 2011, obligating compliance with structural standards for the facilities and implementation of regular inspections, etc. Based on the survey results, the Ministry of the Environment will endeavor to enforce the Water Pollution Control Act properly in cooperation with the local governments.

Keyword: water pollution, Monitoring system

P2-6 REGIME SHIFTS OF YANGTZE SUBTROPICAL SHALLOW LAKES

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Regime shifts between macrophyte-dominated clear-water state and phytoplankton-dominated turbid-water state have been widely reported. On the alluvial plain of the Yangtze River with a dominance of subtropical climate, there are hundreds of shallow lakes. This major geographical area with its well-developed water system and fertile soil was one of the "cradles" of Chinese civilization. However, many lakes in the basin have suffered for decades from cultural eutrophication and fishery over-exploitation, causing increased phytoplankton, deteriorated vegetation and lowered clarity. In this talk, I'd like to introduce our study on regime shifts in these subtropical shallow lakes. Based on a combination of multi-lake comparisons and long-term monitoring, we analyzed the existence of alternative states, thresholds of total phosphorus and turbidity for the regime shifts, potential effects of intensive aquaculture and high ammonia concentration, maintenance of alternative states.

Keyword: regime shifts, subtropical lakes, thresholds, multiple stressors

Technical Session 2: Sustainable Use of Freshwater Resources

P2-7 PUBLIC PARTICIPATION IN SOCIAL AUDITING AND ECO-POLITICS OF WATER QUALITY AND ECOLOGICAL HEALTH OF THE FRESHWATER LAKE UJJANI,

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Maharashtra Vikas Kendra, Pune

Deterioration of water quality of Ujjani Lake, the tail end reservoir on Bhima river - a known World Lake Vision water body - is the result of upstream unmatched, rapid urbanization and industrial growth in last two decades. This huge water body in South Maharashtra is under pollution stress which is affecting its quality and ecology. Constant efforts for wide spread awareness from a decade have consolidated the participatory action plan by involving students of schools and colleges in the region for social auditing and biomonitoring of water quality and ecological status of the Ujjani Lake. The feedback of public participation has led to raising the issues of water quality improvement in Ujjani catchment leading to eco-politics of impact of pollution on community health. A careful assessment of socioeconomic and health issues among the population along the shoreline downstream of urban development has documented that the people have become attentive and responsive of their natural and human right of safe drinking water. People's movement for water security has outlined the political agenda in the region leading to planning and investments for urban and industrial wastewater treatment plants in upstream cities. In this paper, the outcomes of surveys have been discussed articulating the demands of villagers for sustainable, protected and pollution - free water source for agriculture, pisciculture and secured life

Keyword: Water Quality, Eco Politics, Safe Water

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

P3-1 WATER QUALITY ASSESMENT IN THE DIYAWANNA LAKE, SRI LANKA

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Water in Diyawanna Lake, Sri Jayawardenapura, Sri Lanka indicated many water quality degradation due to human activities and interconnected stream discharge. Diyawanna Lake located in the centre of the administrative capital of Sri Lanka. Diyawanna Lake is an important water retention area which is to be completely dredged, de-silted and fully rehabilitated recent past years. In present the lake environment is become deteriorated by human and natural phenomena. The Lake catchment surrounding urban areas are influenced by various industrial zones and homestead. The study was done with the objective of determining the status and trends in water quality assessment in Diyawanna Lake. The results revealed that for the period of 2006-2010; the pH values of varied from 5.2 to 7.4. The electrical conductivity values varied from 0.07 mS/cm to 0.30 mS/cm and from 0.11mS/cm to 0.23 mS/cm respectively. The turbidity values of Location 1 and Location 2 are varied from 4.15 NTU to 33.50 NTU and from 4.00 NTU to 27.90 NTU respectively. The Dissolved Oxygen concentrations changed ranged from 3.02 mg/l to 6.88 mg/l and 2.17 mg/l to 6.84 mg/l respectively. The Nitrate (V)-N values of are varied from 0.01 mg/l to 0.70 mg/l and from 0.01 mg/l to 0.80 mg/l respectively.

Keyword: algae, dissolve Oxygen, electrical conductivity, pH, Turbidity

P3-2 ABUNDANCE AND DISTRIBUTION OF CILIATED PROTOZOANS IN MARANTAO'S LITTORAL AND PELAGIC ZONES OF LAKE LANAO, PHILIPPINES

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Ciliated protozoans are one-celled organisms known as bio-indicators of organic pollution in freshwater ecosystem. The study intended to determine the presence, distribution and abundance of ciliates in Lake Lanao at the littoral and pelagic zones of Marantao, Lanao del Sur during summer season of 2016. It also aimed to determine the trophic state of the waters in sampling stations. Ten (10) morphologically distinct ciliate species belonging to 6 genera, were observed in littoral zone while 11 species belonging to 7 genera in pelagic zone. In both zones the abundances of ciliates were quite low except for station 3 in the littoral zone and it was significantly different from rest of the stations in both zones. The said station was readily accessible for human activities thus probably had higher organic load during sampling which may account for its higher abundance. Although the average abundance of ciliates in the littoral zone (201.56 cells/m³) was higher than the pelagic zone (29.19 cells/m³), but the difference was not statistically significant. Interestingly, the ciliate abundance data when compared to a trophic state classification standard for lakes, the results implied that the water quality in both zones are still categorized as ultraoligotrophic, that is, the water was still pristine and fit for drinking. Species of *Paramecium*, *Vorticella*, *Podophrya*, *Tetrahymena* were commonly distributed in both zones which is reflective of their cosmopolitan distribution. *Oxytricha* sp. and *Loxodes* sp. were observed in littoral zone only while *Glaucoma* sp., *Opercularia* sp. and *Euplotes* sp. in pelagic zone only.

Keyword: ciliates, protozoa, bio-indicators, Lake Lanao, freshwater

P3-3 RELATIVE IMPORTANCE OF PHYSICAL AND BIOLOGICAL FACTORS REGULATING TINTINNID POPULATIONS: A FIELD STUDY WITH FREQUENT SAMPLINGS IN SENDAI BAY, JAPAN

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To examine factors regulating the summer population dynamics of tintinnid species, temporally high- frequency observations of tintinnid ciliates were performed in Hiroura Estuary in Sendai Bay. Sampling was conducted on alternate days from 5 July to 2 August 2010 at three estuary sites to examine which environmental (water temperature, salinity and tidal level change) and biological (abundances of Chl- a, bacteria, protozoans and zooplankton) factors are important for determining temporal changes in abundance and apparent population change rates for tintinnid species. During the study period, 20 tintinnid species were found and showed drastic population changes within a few days, resulting in different tintinnid assemblages from the first to the second half of the study period. Multivariate analysis and generalized linear mixed models showed that several environmental and biological factors were related significantly with the abundance and apparent population change rate of each tintinnid species, but no effect of potential predators such as copepods was found for the abundance and change rate. These results suggest that physicochemical and food conditions play more important roles than predation pressure in short-term temporal changes of tintinnid populations during summer in estuary environments.

Keyword: estuary, microbial-foodweb, microzooplankton, population dynamics, selective feeding

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P3-4 ASSIMILATION OF CYANOBACTERIA BY A FRESHWATER BIVALVE, *UNIO DOUGLASIAE*: ANALYSIS OF STABLE C AND N ISOTOPE RATIOS AND FATTY ACID COMPOSITIONS

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Biomaniipulation for controlling cyanobacteria using the filter-feeding function of bivalves has been studied for the purpose of improving lake water quality, but little is known about whether freshwater bivalves can assimilate cyanobacterial cells after ingesting. In this study, we examined the assimilation ability of cyanobacteria by *Unio douglasiae*, which was kept from July to November, 2017 at the bottom lake Hachiro. The cyanobacterial bloom occurred during July to September. We analyzed the stable isotope ratios of carbon and nitrogen and the fatty acid compositions in *U. douglasiae* and suspended matters of overlying water every two weeks during the experimental period. The stable isotope ratios of carbon and nitrogen of *U. douglasiae* did not reflect the change of those in suspended matters. However, the abundance ratio of cyanobacterial fatty acid biomarker (18:2 ω 6 and 18:3 ω 3) to diatom fatty acid biomarker (20:5 ω 3) in the *U. douglasiae* significantly increased during the occurrence of cyanobacterial bloom. In this period, a significant positive correlation was found between the condition index [dry weight (g)/ shell length (mm) \times shell height (mm) \times shell width (mm)] of *U. douglasiae* and the contribution of cyanobacterial fatty acid in *U. douglasiae* ($r = 0.8272$, $P < 0.01$). The result suggests that *U. douglasiae* assimilates cyanobacteria and it may serve as a useful tool for in Lake Hachiro.

Keyword: Eutrophication, Algal blooms, Bivalve, Filter-feeding

P3-5 THE RELATIONSHIP OF THE MICROBIOTA INCLUDING ALGAL BLOOM FORMING CYANOBACTERIA AND THE ENVIRONMENTAL FACTORS IN LAKE HACHIRO

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In this study, we conducted 16S rRNA gene amplicon analysis of bacterial community structure in the surface water of Lake Hachiro, Japan and examined the effects of environmental factors such as water temperature, rainfall, and nutrients concentration from 2014 to 2016. Rainfall at July to August in 2014 was 2.5 times of those in 2015 and 2016, and two short algal blooms occurred at August and October. In 2015 and 2016, algal blooms were observed for a long term, but toxic algal blooms of *Microcystis* spp. identically occurred at autumn in all years. Furthermore, the similarity test derived that microbiota including algal bloom forming cyanobacteria from 2014 to 2016 was influenced by rainfall before 7 days and water temperature. It was suggested that dominant species of microbiota was changed in the *Microcystis* spp. when there were high water temperature and few rain frequencies and changed in the *Anabaena* spp. when there are a lot of rain frequencies. Because there had been no the analysis of bacterial community structure using the next generation sequencer for the long term such as this study, possibility to be able to find the concrete relationship of the microbiota including algal bloom forming cyanobacteria and the environmental factors by microbiome dynamics was shown for the first time.

Keyword: Eutrophication, Algal blooms, Lake Hachiro, Next generation sequencer

P3-6 DEVELOPMENT OF ONE-INDIVIDUAL DNA SEQUENCING METHOD OF PREDATION METAZOAN FOR TOXIC CYANOBACTERIA

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It is important to investigate protozoa and metazoan which can prey on toxic cyanobacteria, because the predation microorganisms affect the population of toxic cyanobacteria involving worldwide problems. Moreover, we can apply such microorganisms to control or remove toxic cyanobacteria. Therefore, we developed a method without monoculture to determine the 18S rRNA gene sequences for establishing the local database in molecular ecological studies. The experimental procedure using a micro glass capillary for uncultured protozoa and metazoan are shown as follows. Each swimming individual was captured by a glass capillary with the tip diameter of around 100micron meter under an inverted microscope. Then it was transferred into a drop of autoclaved water to wash the individual. This washing step was repeated 5 times at least. Then it was transferred into a PCR tube, and 70% EtOH of 100micro L was put in the tube to fix the individual. After drying completely, PCR mixture of 40 micro L (Tks-GFlex, Takara bio inc., Japan) was added to the tube. A universal primer set for metazoan Metaz 2-F and Metaz 5-R (Machida, R., J., and Knowlton, N. PLOS ONE, Vol 7(9), e46180, 2012) was used for the PCR. Because DNA template concentration from one individual was very low, the optimal condition for the PCR had to be found to obtain enough quantity of amplicons for DNA sequence. As a result, DNA sequences of several rotifer species were determined.

Keyword: eutrophication, harmful algal bloom, toxic cyanobacteria

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P3-7 REGULATION OF DIATOMS ON SILICON DYNAMICS IN THE XIANGXI RIVER

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In order to get insight into the impact of Three Gorges Dam operation on diatom structure and its function on silicon cycle due to diatom assimilation in the reservoir, Using the silicomolybdc blue method and modified Ragueneau method, dissolved silica (DSi) and biogenic silica (BSi) in the Xiangxi River were investigated monthly from February 2015 to December 2016 accompanying with the diatom cell density. Our results indicated that diatom composition and their relationship with silicon concentration were different between lacustrine site and riverine site., respectively. Total diatom cell density ranged from 6.20×10^5 cells/L to 9.97×10^7 cells/L in the lacustrine zone. It varied from 7.90×10^4 cells/L to 1.81×10^7 cells/L in the riverine zone. Diatom cell density in the lacustrine zone was significantly higher than the riverine zone. Centric diatom (Melosira and Cyclotella) were the dominant genus in the lacustrine zone during the whole study period. BSi has a significant linear relationship with diatom cell density. BSi transformation efficient is higher while the standing BSi is lower in the riverine zone than the lacustrine zone. The results imply that TGD decrease the flow velocity dramatically, contributing to a stable diatom composition, causing longer diatom growth period and progressive silicon depletion, enhancing silicon retention in the long term in the reservoir.

Keyword: Diatom, cell density, DSi, BSi

P3-8 SEASONAL CHANGE RELATED TO VERTICALLY DISTRIBUTED DISSOLVED OXYGEN IN EUTROPHIC SHALLOW WATER

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In this study, we estimated the seasonal change of the vertical distribution of water quality in a constantly watered shallow regulating pondage. During the iced season, a stratification phenomenon was distinguished. The illuminance was 0 lux at the bottom layer. Photosynthesis had not emerged. The dissolved oxygen (DO) concentrations in the bottom layer was low because of organic matter decomposition, although the water temperature was low. Water mixing occurs with ice melting; DO and pH were increased by phytoplankton photosynthesis. Particularly, pH exceeds 11, which presents the possibility of damage to aquatic organisms. During summer, stratification formed through the day and night, the DO concentration decreased. Phytoplankton activity with suppression by photo-inhibition. In autumn, the water was diluted by heavy rains, but the DO concentration in the bottom layer remained low. This regulating pondage serves roles of landscape formation and bird habitat, but the underwater environment presents a harsh environment. Water quality improvement is also necessary to improve biodiversity.

Keyword: eutrophication, phytoplankton, stratification phenomenon, low dissolved oxygen, aquatic organisms

P3-9 A REVIEW ON THE PELAGIC ECOLOGY OF LAKE LANAO, MINDANAO IS., PHILIPPINES

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Lake Lanao, one of the world's ancient lakes, is scarcely studied. This review focuses on the hydrodynamics and plankton of the pelagic system of the lake since it was first investigated in the 1960s to arrive at objective insights for an ecosystem-based management of the lake. Significantly contributing to the lake water is the intact forest in the eastern sector of the Lake Lanao Watershed. Still unstudied are major rivers and numerous intermittent tributaries that sustain lake water. Having an atelomictic epilimnion, the lake is categorized as a warm monomictic type with overturn occurring in January to March. Nutrient levels when the lake was at its relatively pristine state indicated a high sensitivity to levels of dissolved nitrogen suggesting a pelagic ecosystem that is bottom-up or resource controlled. Recent water quality analyses in 2006 and 2014 indicate a eutrophic, coliform-contaminated, and invasive zooplankton species-dominated state with anthropogenic input as the possible main driver. Hence, the flux of nutrients and pollutants should be a top priority of an ecosystem-based management effort within a Lake Lanao watershed biodiversity conservation framework. An innovative socio-environmental approach involving participatory, multisectoral, multidisciplinary, integrated and co-management efforts needs to be inherent in conservation efforts. Also integrated to the watershed modelling and management framework is the looming climate change, which may undoubtedly lead to further loss of biodiversity services of Lake Lanao.

Keyword: Lake Lanao, ancient lake, zooplankton, phytoplankton, freshwater ecology

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P3-10 RELATIONSHIP BETWEEN THE WHITE TURBIDITY AND THE FISH PRODUCTION IN LAKE KASUMIGAURA

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Comparative study was conducted on the occurrence and resolution of white turbidity in Lake Kasumigaura and the relationship between the low level period and the increase period of the pond smelt resources, and the following process was thought to be mediated. When the FSS decreases and turbidity is eliminated, the transparency increases and the light environment improves. Then, phytoplankton increases, and small zooplankton such as rotifers that feed on it increases. As a result, the survival rate of the pond smelt larvae improves and the adult resources also increases. From the above, it was suggested that when white turbidity occurs, the amount of sunlight incident into lake water is insufficient, the photosynthesis by phytoplankton is inhibited, the primary production is decreased, and the healthy structure of the original ecosystem is distorted.

Keyword: Lake Kasumigaura, white turbidity, phytoplankton, rotifer, pond smelt

P3-11 SENSITIVITY LEVEL OF PHYTOPLANKTON TOWARDS NUTRIENTS AND ZOOPLANKTON IN EBONY LAKE, PIK RESIDENCE, NORTH JAKARTA

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Lake Ebony in Pantai Indah Kapuk Residence, North Jakarta received input of organic material which lead a dynamic of nutrients and plankton community. This study aimed to analyze phytoplankton sensitivity level to water quality and zooplankton the lake. Water and plankton were collected from January to December 2015. There were 36 genera of phytoplankton from six classes, and seven genera of zooplankton from Three groups. Cyanophyceae and Chlorophyceae sensitive towards zooplankton; and Euglenophyceae and Dinophyceae sensitive towards orthophosphate

Keyword: sensitivity level, phytoplankton, zooplankton

P3-12 TROPHIC AND ECOLOGICAL STATES OF GARDEN HOUSE ORNAMENTAL LAKE, PANTAI INDAH KAPUK, NORTH JAKARTA

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Garden House Ornamental Lake is one of the artificial ponds in Pantai Indah Kapuk, and it has received high input of organic matter from domestic activities. Input of organic matter may change water quality, increase trophic states, and effect the ecological conditions of the water. The purpose of this research is to analyze trophic and ecological states of Garden House Ornamental Lake. Water quality, especially nutrient was measured to support tropical state. The tropical state of lake was analyzed using Nygaard Index while the ecological state with MedPTI Index (Mediterranean Plankton Trophic Index). Concentration of orthophosphate in the lake is more than 0,1 mg/L. Nutrient parameters at Garden House Lake are high showed by high concentration. The trophic state of Garden House Lake is eutrophic, shown by 9,5-10,5 value of Nygaard index and an ecological state is poor until bad, shown by 1,46-1,85 of MedPTI index. Ornamental lake could be overwhelmed by wastewater treatment to restore lake state.

Keyword: Plankton, Nutrient, Management

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P3-13 CURRENT AND RECENT CHANGES IN HALOCLINE AND CIRCULATING DEPTHS IN LAKE OGAWARA

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Lake Ogawarako is a brackish lake, located in the east part of Aomori Prefecture, the northernmost main island of Japan. There, catches are among the highest for inland fisheries of Japan. However, in recent years, eutrophication has been progressing, and measures for deterioration of the water quality is demanded. The purpose of this study is to better understand the current status and temporal changes of hydrological characteristics such as halocline and circulating depths, which greatly influences the water quality. To achieve that purpose, we conducted a long-term survey of vertical distribution of temperature, salinity, and dissolved oxygen at the center of the lake from 2006 to 2017. In spring and autumn, a vertical circulation was observed up to ca. 15m (just above halocline), however, thermocline was formed near 5m in summer. Halocline was formed between 14-18 m throughout the year, with the density of 16m fluctuated over observing period. The reason was partly attributed to the vertical mixing up to 16m by wind when strong storms/typhoons hit, based on the Wedderburn number. Since a large amount of nutrients are accumulated in high salinity layer, this fluctuation could greatly influence to nutrient status in shallower layer.

Keyword: poor oxygen, eutrophication

P3-14 RELATIONSHIP BETWEEN TN/TP RATIO AND PRINCIPAL COMPONENT SCORES ON AN IRRIGATION POND COVERED WITH FLOATING-LEAVED PLANT

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Water chestnut, which is a type of floating-leaved plants, grow gregariously every year in Oosawaike Pond. The study objective is to grasp the water quality tendency of the pond water and statistically grasp the status of the primary production. Water sampling and observation of pond surface carried out in order to determine water quality and coverage with leaf of water chestnut. The main component analysis were performed to a total of fifteen items of monthly fourteen data in water quality and coverage with water chestnut leaf. Status of primary production in pond were explained by using relationship between floating-leaved plant as first main component and phytoplankton as second main component. TN/TP ratio indicated twice variation patterns from decrease to increase in summer and autumn. The points respective to these variation of TN/TP ratios characteristically placed at the main component scores figure.

Keyword: primary production, irrigation pond, aquatic plant, multivariate analysis

P3-15 POTENTIAL VEGETATION FOR NITROGEN REMOVAL IN LAKE RIPARIAN AND CATCHMENT AREAS

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Eutrophication has worsened water quality in at least 15 priority lakes in Indonesia. Eutrophication level (oligotrophic, mesotrophic, eutrophic, and hypertrophic) is one of indicators in defining lake health status. Based on eutrophication level, only two lakes were oligotrophic, while the others were in eutrophic and hypertrophic conditions. To reduce lake degradation, vegetative rehabilitation in lake water catchment and riparian areas was proposed. Some studies provided information on vegetation for nutrient removal from water body. However, very few studies focused on measuring vegetation capability in Nitrogen (N) removal from soil. This research aims to assess N content of plant species growing in Rawapening riparian as preliminary information on plant potency for N removal. Plants and soil samples were taken in a relatively undisturbed riparian area in Bejalen village. Each plant was labeled with local name and identified using "Tumbuhan Berguna Indonesia" book to determine their scientific names. There were nine plants found: *Ampelas*, *Cangkkring*, *Elo*, *Gempol*, *Dempul*, *Johar*, *Waru*, *Bunga Kuning* and *Mangsi*. Plant and soil N contents were analyzed in WMTC Laboratory. Riparian soil N content was 0.21%. *Ampelas*, *Mangsi* and *Cangkkring* had the highest N content with 0.24, 0.13 and 0.12%, respectively. N content for *Bunga Kuning* was 0.7%, while for *Lo*, *Gempol*, *Dempul*, *Johar* were 0.5% each and for *Waru* was 0.3%. *Ampelas*, *Mangsi* and *Cangkkring* are potential for N removal as their N contents were approaching N soil.

Keyword: eutrophication, Nitrogen, vegetation, riparian, water catchment areas

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P3-16 THE INCONVENIENCE OF TRADITIONAL FISHING PRACTICE ON AQUATIC ECOSYSTEM OF LAKE NOKOUE IN REPUBLIC OF BENIN (WEST AFRICA)

Bernadin Elegbede Manou

National Water Institute- University of Abomey Calavi

This case study has assessed the vulnerability of Lake Nokoue to pollution by both domestic waste and Acadja fishing practice".

Situated in coastal area of Benin, where more than four millions of people are living, lake Nokoue is the biggest lake in the West Africa due to its big surface and halieutic(fisheries) productivity. Unfortunately, this lake confronts a lot of challenges due to traditional system of fishing called "Acadja" and bad domestic waste management. This study highlights that "acadja" practice and domestic waste destroy the aquatic fauna and therefore threaten and disrupt food security of habitants by reducing fish productivity. As a matter of fact, this practice of "acadja" reduces the transparency, light and increases water pollution through the proliferation of aquatic plant which diminish the amount of dissolved oxygen in the lake. The analysis was made by spectrophotometer DR/2000 hach, multiparameter wtw 340 and atomic absorption spectrophotometry for toxic metal (lead). The result has shown that dissolved oxygen is above 1750mg/L and the content of nitrite is more than 15,25mg/L while lead concentration shows high values above WHO standard. However, investigation was made among riverside habitants and has revealed that the weight of fishes is reducing drastically from year to year.

Keyword: ecosystem services, ecosystem functions, biodiversity evaluation, fisheries

P3-17 ASSESSMENT OF THE EFFECT ON WATER QUALITY IN TSUCHIURA PORT BY THE OPERATION OF ITS DIRECT PURIFICATION FACILITY

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In September 2013, a direct purification demonstration facility - applying Coagulation Magnetic Separation technology - was installed and operated on the shore of Tsuchiura Port; its main purpose was to remove phosphorus from the lake water, and thereby remove the main nutrient necessary for the growth of phytoplankton directly from the lake. In this research, the authors aimed to document port water quality improvement achieved by operation of the facility through examination of the port's water quality. The decrease in phosphorus at Tsuchiura Port correlated with the increase in treated water volume from the operation of purification facility - overall, phosphorus in the lake water decreased by about 23 kg. In particular, the purification effect of phosphorus in water area A was particularly high, and in addition, the reduction of chlorophyll a at Tsuchiura Port was recognized as being due to operation of the purification facility. The authors have therefore been able to conclude that operation of the purification facility has been effective in the suppression of phytoplankton.

Keyword: Eutrophication, nutrient dynamics, water purification, ecological function

P3-18 WATER QUALITY CHANGE IN LAKE HAMANA BETWEEN 1995 AND 2017

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Lake Hamana is a semi-enclosed brackish lake which is surrounded by agricultural land and urbanized area and has experienced varying levels of water quality over time. Vertical profiles of nutrients, total phosphorus, total nitrogen, and dissolved oxygen were obtained monthly from 1995 to 2017. Freshwater samples, in addition, were also obtained in the river flowing into the lake. Mann-Kendall trend analysis was used to establish the significance of the long-term trends for all parameters. Phosphate, TP, and TN concentrations showed significant decreases at all lake stations, except for phosphate concentration at one station of the bottom water and TN concentration at two stations of the surface water. At all river stations, TP and TN concentrations also showed significant decreases. The phosphate decreases reflect the reduced load of organic matter and nutrients into the lake due to increasing sewage coverage and implementation of advanced wastewater treatment techniques. In contrast, nitrate concentration increased significantly in the eastern part of the lake, whereas ammonium and TN concentration decreased significantly. This may be an effect of nitrification in the lake and/or insufficient wastewater treatment efficiency of nitrification/denitrification process. The ratios of DIN to phosphate in the surface waters were much higher than the Redfield ratio for all stations, and these ratios increased significantly during the observation period. Continued declines in phosphate concentration and nitrate concentration increase could strengthen phosphorus limitation of primary production in Lake Hamana.

Keyword: eutrophication, nitrogen phosphate cycle, sewage, Mann-Kendall trend analysis

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P3-19 SUSTAINABLE APPROACH TO CONSERVE AN ANCIENT WATER SUPPLY SYSTEM: SALIM ALI LAKE AT AURANGABAD, (MS), INDIA

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Salim Ali Lake is one of the historical lake in Aurangabad city of Maharashtra State which was a planned city in medieval period. Priorly known as, 'Khijjar Talao', later on, 'Delhi Gate Talao' and now known as, 'Salim Ali Lake'. This was an excellent example of the ancient water supply system by means of, 'Nahar- E- Ambari', founded nearabout 400 years ago. Originally the lake area was 54 acres and now reduces to 34 acres placed and is a hub of migratory birds.

The sewage and effluent from residential and industrial areas may responsible for the contamination of surface water reservoirs. The major factors contributing to the pollution of natural reservoirs of the city are; discharge of untreated sewage and effluent, poor sanitation facilities, dumping of municipal solid waste, erosion from the catchment areas, etc. Aurangabad Municipal Corporation had constructed a 5 MLD Sewage Treatment Plant in April 2013 on a lake basin.

In present study the water quality of Lake and outlet of Sewage Treatment Plant, were analyzed. The parameters such as turbidity, Electrical Conductivity, Total Dissolved Solids, DO and Total alkalinity were not compatible with the prescribed standards.

Availability of sewage treatment plant is a crucial problem at highly populated cities. Lake ecosystem and Sewage Treatment Plant should be studied simultaneously for the sake of conservation. There is an urgent need to improve the efficiency of STP so as to conserve such ancient water supply monument. Thereby only we can make harmony with the aquatic ecosystem.

Keyword: Ancient Water Supply System, Malik Amber, Nahar- E- Ambari, Salim Ali Lake, Physico chemical analysis

P3-20 NOTES ON THE RESULTS OF A WATER QUALITY SURVEY FOR LAKE USHIKUNUMA, IBARAKI PREFECTURE, JAPAN

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Lake Ushikunuma is located in the southern part of Ibaraki prefecture; its waters have long been used for agricultural purposes and for fishing, but its water quality has deteriorated since approximately 1975 as development of its catchment increased. Therefore, in accordance with the Prefecture Lake Ushikunuma Water Quality Conservation Plan, the authors conducted water quality surveys at multiple points in the lake and the influent river. In addition to documenting current water quality, the study involved plankton surveys, gathering weather data, etc., in an effort to understand fully the pollution mechanism operating in the lake. In the recent, third phase of the data collection program - 2012 to 2016 the Chemical Oxygen Demand (COD) of the lake center and the incoming river was lower than the COD of the third phase (COD: 7.2 mg / L, Total Nitrogen (TN): 1.3 mg / L, Total Phosphorus (TP): 0.059 mg / L), however it remains higher than the final target environmental standard (COD: 5 mg / L, TN: 0.6 mg / L, TP: 0.05 mg / L in the lake), and documentation of the situation continues.

Keyword: Eutrophication, Water quality management, Lake Ushikunuma, COD

P3-21 ICTHIOINDICATIVE ASSESSMENT OF WATER QUALITY IN URBAN LAKES (ON THE EXAMPLE OF KAZAN, RUSSIA)

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Fishes react sensitively to changes in environmental conditions, in particular the chemical composition of water, suspended matter and bottom sediments. Also, a relatively high degree of adaptation of fish to changing conditions of their life is known, but it is far from boundless.

In this work we investigated the morphometric, parasitological and biochemical features of the *Perccottus glenii* population of some urban lakes in the city of Kazan. The results of the assessment of the state of the aquatic ecosystems of urban lakes using ichthyoincidence methods are presented. It was noted that in the Lake Dryanichnoye *Perccottus glenii* is characterized by the most deviating from the norm values of the liver mass index, biochemical blood indices and parameters of helminth infection.

Keyword: Ichthyoincidence method, *Perccottus glenii*, Urban Lakes

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P3-22 CONIFEROUS FORESTS AND LAKES: THE IMPACT OF PINE POLLEN ON WATER QUALITY

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It is believed that in comparison to other types, forest catchments provide smaller quantities of allochthonous matter. Therefore, they seem to be a factor that stabilize functioning of midforest lakes. Some papers point out that forested catchment can provide to the freshwater ecosystems significant amounts of organic matter (humic acids) and trigger lakes humification. We estimated if wind dispersed pine pollen may change water quality and accelerate increase of fertility of several lakes located in forested areas. We found that pine pollen is rich in nitrogen and phosphorus. Average phosphorus content was about 20 g kg and nitrogen about 22 g kg of dry mass of pollen. Based on field experiment we estimated that during the pollen season (May - June) average pollen deposition is about 12 g d.m. per a square meter of the lake. It gives, every year provision more than 20 kg of P and over 25 kg of N per one hectare of the lake. According to laboratory experiment we provided that pollen fell on the water very quickly release nutrients, and also become culture for bacteria and fungi. In all investigated lakes we found the increase of concentrations of nitrogen and phosphorus in littoral zone during pollen season. Certainly this loads of nutrients may stimulate the development of primary producers and FPOM consumers, however this requires further research.

Keyword: forested areas, pine pollen deposition, lakes eutrophication

P3-23 CONTRIBUTION OF NITROGEN DEPOSITION TO TAIHU LAKE

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Atmospheric nitrogen (N) deposition represents an important source of reactive nitrogen to ecosystems. However, excessive N inputs could cause adverse ecological effects. In present study, the Taihu basin was taken to explore the characteristics of N deposition and its contribution to water eutrophication. Results with the space technology from ArcGIS 10.0 show that the annual average of total deposition (TN), total wet deposition (TN_w) and total dry deposition (TN_d) rate were 6154, 1142 and 5012 kg km⁻², respectively. A significant positive correlation was found between the TN deposition contents with rainfall ($R=0.803$, $P<0.01$). The TN deposition concentration have a significant negative correlation with the rain intensity ($R=-0.783$, $P<0.01$). The riverine input of TN was estimated to be 112500 t N a⁻¹. The main N pollutants come from domestic sewage (account for 48.88%) and agriculture (account for 28.17%). TN deposition contributed to the lake was 14400 t N a⁻¹ and accounted for 12.36% of annual riverine input of TN. Therefore, the atmospheric N deposition contribute to water N load can't be ignored.

Keyword: nitrogen deposition, water eutrophication, driving force, human activity, Taihu watershed

P3-24 SUSTAINABLE UTILIZATION OF A CRATER LAKE BY RIPARIAN COMMUNITIES: THE QUALITY OF THE WATERS OF LAKE BOSOMTWE IN THE ASHANTI REGION OF GHANA

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Water has vital role in all aspects of life with its significance visible in its sustenance to the environment, local economies, food security, ecosystem productivity, and, health. The importance of freshwater throughout human history has been seen its interrelationship with man. The importance of Lake Bosomtwe has been considered in relation to its quality and the services this resource provides, considering the inability of humans to survive without it. The study involved twenty-six (26) riparian communities surrounding the largest Crater Lake in Africa, the Lake Bosomtwe. Water sources such as lake, streams and boreholes used as drinking water sources were collected quarterly for a period of two years. These were analysed bacteriologically for the determination of total and faecal coliform, *E. coli*, *Aeromonas sp.*, *Enterococcus sp.*, *Salmonella sp.*, *Pseudomonas sp.* and total heterotrophic bacteria (THB) using Membrane filtration and pour plate. The results showed variation of bacteria counts in all the water sources. The highest *E. coli* counts of 2.9×10^3 cfu/100ml was recorded in the lake and the least in the borehole 2.1×10^1 cfu/100ml. The difference between the total coliform, faecal coliform and *E. coli* counts and the water sources was significant ($p<0.05$). Bacteria in the different water sources had higher bacteria counts during the dry season than the wet season which are statistically significant ($p<0.05$). Drinking these waters without any form of treatments could pose health risk to consumers because of the presence of bacteria from water pollution. These water sources can however be used for domestic purposes.

Keyword: Lake Bosomtwe, Water Quality, Seasonal changes, Ecosystem, Water Pollution

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P3-25 STUDY ON BEHAVIOR OF INORGANIC NITROGEN IN LAKE NAKAUMI

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We developed a method for quantifying NH_2OH and N_2H_4 . These are known as intermediates for nitrification, denitrification, and Anammox reaction. This study aimed to elucidate the mechanism of nitrogen circulation from the behavior of inorganic nitrogen species in brackish Lake Nakaumi. The lake is connected to the Sea of Japan via the Sakai Channel. The seawater flows into the Lake Nakaumi. Incoming seawater contains dissolved oxygen, and there is supply of dissolved oxygen to the bottom layer. As a result, the bottom layer of Lake Nakaumi is a microaerophilic environment. In the southern part of Nakaumi, NO_2^- and NH_2OH , which are intermediates for nitrification, were detected at relatively high concentrations. From these results, it was suggested that the supply of oxygen by inflow of seawater has a large effect on nitrogen circulation such as nitrification and denitrification.

Keyword: nutrient dynamics, hypoxia, brackish lake, nitrous acid, hydroxylamine

P3-26 NUTRIENT DYNAMICS AND TROPHIC STATE OF LAKE TEMPE IN SOUTH SULAWESI, INDONESIA

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Lake Tempe is a floodplain lake that located in South Sulawesi province, Indonesia. Since many years ago, Lake Tempe have been providing great benefit for local people in daily activity and economically. This lake is as great fishery resources, and as nutrient deposition especially in dry season. However, in recent years, some problems occurred in this lake, such as environmental degradation and decreasing fishery production. High sedimentation rate and aquatic plants blooming have degraded environment lake. The local government plan to revitalize this lake by dredging some area of Lake Tempe. However as floodplain lake, there are some zones that have ecological function for fishery as breeding zone and feeding zone. Base on this background, the aim of study is to reveal nutrient dynamic in permanent and nonpermanent zone of the lake. That information will be used to determine the important zone for fishery or agriculture related to the nutrient rich or trophic level of this lake. The results indicated that concentration of dissolved total nitrogen (diss-TN) in nonpermanent inundation zone (zone 1, 2, 3, 4, 5) increased significantly when water level increased (July 2017). The decomposed aquatic plants and residue fertilizer are supposed contribute to increase concentration diss-TN in nonpermanent inundated zone. The concentration of diss-TN was 421 to 996 mg/m^3 , it is categorized eutrophic to super trophic state. The concentration of Dissolved Total Phosphorus (diss-TP) was increasing during medium water level, the concentration was higher than 96 mg/m^3 , it is categorized hypertrophic state.

Keyword: nutrient, trophic state, nitrogen, phosphorus, floodplain lake

P3-27 STUDY ON THE GROWTH OF PERDIMUM NUMBONATUM VAR. INAEQUALE AND SCENEDESMUS BIJUGA WITH DIFFERENT ORGANIC PHOSPHORUS SOURCES

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Phosphorus plays a vital role in algal growth, and organic phosphorus is an important part of it. It is of significance to study the growth and competition by different forms of phosphorus for better understanding of the difference. From the aspect of organic phosphorus, the PM4A plate (61 forms of P) was used as experimental P sources in this research. We use the PM4A to cultivate *Peridinium umbonatum* var. *Inaequale* and *Scenedesmus bijuga* and Distinguish the growth of algal and competition by different forms of organic phosphorus. In a word, both of the two algae have a selectivity to utilize different organic phosphorus in the mono-culture and the co-culture. *Peridinium umbonatum* var. *Inaequale* has a better utilization on nucleotide phosphate and glucose phosphate. While *Scenedesmus bijuga* has a better utilization on nucleotide phosphate, amino acid phosphate and phosphoGlyceric acid. Two algae have a higher bioavailability to organic phosphorus bond C-O-P than C-P. The most significant organic phosphorus source for the promotion of *Peridinium umbonatum* var. *Inaequale* was triethyl phosphate.

Keyword: organic phosphorus, triethyl phosphorus, perdimium umbonatum, inaequale, Scenedesmus bijuga

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P3-28 INFLUENCE OF NUTRIENT COMPOSITION ON PHYTOPLANKTON COMMUNITY IN LAKE SUWA

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In this study, seasonal variations of nitrogen, phosphorus, and silica and phytoplankton in lake water was observed in order to clarify the relationship between nutrient composition and phytoplankton in Lake Suwa. Lake and rivers water were sampled. Nutrient concentrations in water were measured. Chlorophyll a concentration and number of algae cells in lake water were also measured. DIN restrictions were accepted in 1979, 2016, and 2017. Also, DSI restrictions were granted in 1979 and 2017. It was confirmed that the alteration of algae composition was reflected by each nutrient restrictions in 1979, 2016, and 2017. The change of nutrient ratio in the lake water is caused by the advancement of purification by sewerage spreading and/or the uptake of silica by diatom. These changes of the nutrients ratio alter the species of algae that dominate in the summer.

Keyword: Nutrient dynamics, Primary production, Ecosystem function

P3-29 WATER QUALITY ASSESSMENT AND TROPHIC STATUS DETERMINATION OF LAKE LANAO, MINDANAO ISLAND, PHILIPPINES

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Lake Lanao is the second largest lake in the Philippines, and is of great biological, ecological, economic and social importance. Since the first studies by Frey and Lewis in early 70s, various changes have occurred. Thus, this study sought to assess the water quality and make a determination of the trophic status of Lake Lanao during the period June 2016 - February 2017. An offshore station was chosen to represent the lake. The Secchi disk depth was taken while measurements made for conductivity, dissolved oxygen, pH, and temperature. Water samples were collected, kept in a cooler, and analyzed in lab for nutrients (nitrate-N, ammonia-N, total phosphorus), alkalinity and chlorophyll-a. Dissolved oxygen value showed no lack of oxygen for use of the lake organisms. The values for the other parameters showed good water quality and were in the range for that of a healthy lake. Based on the table prepared by Brown and Simpson, and trophic status index (TSI) based on the equations formulated by Carlson gave values equivalent to an oligotrophic-mesotrophic lake. Lake Lanao is trending towards eutrophication, which is a natural process in many freshwater ecosystems as they age. However, since human-caused nutrient loading can accelerate this process, cultural eutrophication can be controlled by community and management practices in the catchment basin that will restrict the input of pollutants into the lake.

Keyword: water quality, primary production, eutrophication

P3-30 WATER QUALITY CHANGES AND EFFECTS OF POLLUTION IN KISUMU BAY WATERS OF LAKE VICTORIA

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The study was undertaken in Kisumu bay, Lake Victoria with objectives to determine water quality status, pollution levels and impacts on lake waters. Parameters were analyzed using APHA method. Relationship between phytoplankton counts, nutrients and physicochemical parameters was statistically determined.

River Kisat depicted poor water quality with mean DO 1.4 mg/l, Conductivity 844 μscm^{-1} and BOD 228 mg/l. Nutrients were high with mean TN ranging 0.807 ± 0.170 mg/l to 5.390 ± 0.413 mg/l, while mean TP ranged 0.088 ± 0.010 to 0.317 ± 0.039 mg/l in the bay waters. Mean $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$ was 0.055 ± 0.048 mg/l and 0.054 ± 0.042 mg/l respectively. Phytoplankton taxa, Cyanophyta, Chlorophyta, Bacillariophyta and Pyrrophyta were identified, with 20 identified algae species. Chlorophyll "a" concentration was high 0.308 ± 0.085 mg/l. Positive correlation was observed on nutrients and phytoplankton densities with significant ($r = 0.918$) between phytoplankton counts and TP. TN: TP > 12, indicating that P was the nutrient limiting factor. Transparency was low 0.47 ± 0.09 m. T P and TN mean values 0.188 and 2.946 mg/l were beyond upper limits given by OECD of 0.02 mg and 0.2 mg/l.

Therefore, as a result of pollution from River Kisat, the elevated nutrients, low transparency, increased blue green algae and water hyacinth in Kisumu bay is a sign of water quality deterioration and a water mass undergoing eutrophication. Mitigations recommended included rehabilitation of Kisumu Municipal waste treatment plant, effecting sustainable water quality monitoring programme and enforcement of existing pollution control laws.

Keyword: Transparency, Phytoplankton, Eutrophication, Sustainable water quality monitoring, Pollution control

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P3-31 INFLOW TO THE RIVER AND CHANGES OF ORGANIC MATTER THAT CONSTITUTING C3 AND C4 PLANT

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In organic geochemistry, indices relating to organic substances derived from plants such as lignin phenol and carbon stable isotopic ratios ($\delta^{13}\text{C}$) are used, and restoration of paleo-vegetation has been carried out. However, the compositions of organic matter might change due to biodegradation, physical and chemical decomposition. Therefore, it is important to grasp how to be changed of values of indices derived from changes of the organic matter. In this study, we investigated changes of the plant-derived organic matter when flowing into soil and river. Samples were selected *phragmites* as C3 plant and *Miscanthus* as C4 plant, and besides plants, soils, sediments and surrounding river water (POM, DOM) were collected in these colonies. As a result of measurement of these organic matter and carbon stable isotopic ratios, the $\delta^{13}\text{C}$ values of plants is reflected well in the values of organic matter in soil and sediment, and they gradually became large. It was also found that the acid/aldehyde ratio of lignin phenol increase after the leaves fell down and the decomposition progressed in soil, sediment and water.

Keyword: C3-C4 plant, surface water and groundwater, soil, biodegradation, stable carbon isotopic ratio

P3-32 LESSON LEARNED FROM MANAGEMENT OF WEST LAKE (HO TAY) IN HANOI CAPITAL OF VIETNAM AFTER A HALF CENTURY

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Ho Tay (West Lake), a more than 500 hectares natural lake is located in the Western of Hanoi Capital, Vietnam. The lake has played very important role in ecosystem services for the city in the past, present as well as in the future.

After over a half century, flowing with the history of Vietnam, the management of West Lake could be divided into 3 periods: 1) from 1954 - 1975: war for reunification of the country; 2) 1975 - 1986: socio-economic development after the war and; 3) 1986 - up to date (2017): "Open the door" or "Renovation" which lead to rapid urbanization of Hanoi Capital.

Despite of many efforts in management have been undertaken, in comparison with the 1st period, our research analysis showed that in the 3rd period, water quality has been polluted, and biodiversity has been degraded seriously. Two hundreds of tons of fishes and aquatic animals were died suddenly in October 2016!

This paper will touch upon the experiences and lessons learned after a half century in management of West Lake toward a better conservation and management of West Lake.

Keyword: West Lake, Management, Biodiversity, Water pollution, lesson learned

P3-33 CLIMATE CHANGE IMPACT ON WATER TEMPERATURE AND DO IN LAKE BIWA AND ITS MECHANISM

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According to the IPCC Fifth Assessment Report, it is concluded that global warming is very likely due to an increase in human-induced greenhouse gases. Global warming is predicted to change the occurrence frequency and intensity of abnormal weather such as intense heat and short time heavy rain, and it is thought that it will have a considerable influence on the lake ecosystem. Therefore, In this study, we conduct a numerical simulation by inputting the outputs of Global Climate Model GCM20, a high spatial and temporal resolution model, into a three-dimensional hydrodynamics and water quality model. it was showed that t temperature will rise throughout the year, and the occurrence frequency of heavy rain will increase in the future. Our simulation results showed that the water temperature will rise by about 1.5 °C in all layers in the future. In addition, dissolved oxygen in the bottom layer will decrease by about 2 mg / L. It was showed that climate change will cause further Hypoxia progression at the bottom layer in Lake Biwa. Moreover, it was showed that the change in heat exchange amount on the water surface is most dominant in the change in water quality in Lake Biwa.

Keyword: Climate change, Lake Biwa, Dissolved Oxygen, Numerical simulation

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P3-34 RECONSTRUCTION OF PALEO VEGETATION RECORDED FROM THE LAKE BAIKAL SEDIMENT

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Knowing of paleo-climate and vegetation changes can be a part of information to take measures against rapidly climate changes which will be to occur in the future. In this study, we analyzed terrestrial organic compounds contained in a sediment from Lake Baikal, where is located in Northern hemisphere high latitude region, as a paleo-vegetation tracer, and try to reconstruct paleo-environmental changes around Lake Baikal. From the Lake Baikal sediment, characteristic terrestrial organic compounds of lignin phenols, long chain fatty acids, and cutin acids were detected. These terrestrial organic compounds showed the highest concentrations between 36 and 50 cm of depth of the sediment, implying high inputs of terrestrial plants at this interval. Furthermore, vegetation tracers obtained by the lignin phenol composition indicated that these high inputs of plants had a high contribution of herbaceous plants and degraded products. These vegetation characteristics is similar with the current west region of Lake Baikal, and it was considered that the high inputs were transported by the strong wind coming from the west area.

Keyword: climate change

P3-35 INFLUENCE OF CLIMATE CHANGE ON WATER QUALITY IN LAKE KASUMIGAURA

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Lake Kasumigaura is a shallow lake with a mean depth of 4 meters located in the southern part of Ibaraki Prefecture, Japan. Various water pollution prevention measures have been taken so far in the lake's catchment, but while influent river water quality has been improved, values for Chemical Oxygen Demand (COD), Total Nitrogen (TN), and Total Phosphorus (TP) in the lake have not recovered enough to comply with applicable environmental standards and the reason for this has not been clear. As a result, the authors conducted a statistical analysis on long-term water quality variation in Lake Kasumigaura and examined the influence of climate changes - such as global warming - on the lake's water quality and ecosystem. At the center of the lake, our examination detected regime shifts in 1977-1978, 1987-1988, and 2012-2013 for COD, in 1991-1992 and 2003-2004 for TN, and in 1991-1992 and 2009-2010 for TP, with similar evidence found at other stations in the lake. These timings roughly agreed with published timing for the Pacific Decadal Oscillations (PDO), and so as the fluctuation tendency in phytoplankton cell number agreed well with that of climate changes, it is suggested that the water quality and ecosystem of this lake are affected by climate change.

Keyword: ecosystems functions, water pollution, eutrophication, nutrient dynamics, climate change

P3-36 A STUDY ON RELATIONSHIP BETWEEN ATMOSPHERIC TEMPERATURE AND LAKE WATER TEMPERATURE

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In this article, we studied 3 things.

First, in Lake Kasumigaura, Lake Tega and Lake Inba, we studied relationship between daily mean measured atmospheric temperature and daily mean measured water temperature. These three lakes belong to the Tone River basin.

Secondly, in Lake Inba, it was added to measured temperature from -5 to 5°C. And we estimated water temperature using heat budget method with the temperature. we studied relationship between processed atmospheric temperature and estimated water temperature.

Finally, we set water temperature was estimated by measured atmospheric temperature as standard water temperature and we studied the mean yearly differences between standard water temperature and water temperature was estimated by processed atmospheric temperature.

As a result, in first result, water temperature rose by 1°C as atmospheric temperature did by 1°C in three lakes.

And in second result, estimated water temperature rose by 0.9°C as atmospheric temperature did by 1°C in all simulation patterns.

In third result, change amount from standard water temperature to estimated water temperature using processed atmospheric temperature was 0.5°C in that change amount of processed atmospheric temperature relative to 1°C. This change amount of water temperature was thought to be due to downward-Longwave radiation, latent heat flux and sensible heat flux including atmospheric temperature.

Keyword: climate change, water quality management, effects of climate change

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P3-37 ASSESSMENT OF HEAVY METALS CONTAMINATION OF BOTTOM SEDIMENT IN TONLE SAP LAKE, CAMBODIA

Boreborey Ty

Institute of Technology of Cambodia

Thirty-nines bottom sediments samples were collected from Tonle Sap Lake for heavy metals analysis. Concentration of selected heavy meals including Cd, Cr, Cu, Fe, Mn, Pb, and Zn were analyzed using atomic adsorption spectrophotometer (AAS-7000). The mean concentrations of heavy metals were as follow: of Cr, Cu, Fe, Mn, Pb and Zn in the sediment samples were: 0.018 µg/g for Cd, 0.83 µg/g for Cr, 1.41 µg/g for Cu, 35334.87 µg/g for Fe, 212.49 µg/g for Mn, 43.86 µg/g for Pb, and 6.61 µg/g for Zn. Sediment quality guideline was applied to assess the quality of sediment. The mean concentration of Pb was twice of the geochemical background (ASV). The mean concentration of all selected heavy metals were under the severe effect level (SEL) values, whereas Pb were exceeded toxicity reference values (TRV). The pollution load index (PLI) value indicated that all 39 sampling sites unpolluted by heavy metals. Base on geo-accumulation index Pb, Mn, Cu, Cd, Fe, Zn and Cr had I-geo values were between 0 to 1, it indicated that heavy metals contaminated in Tonle Sap Lake was in the class of non-polluted to moderately polluted.

Keyword: heavy metals, bottom sediment, geo-accumulation index, pollution index

P3-38 EVALUATION OF HYPOXIC WATER MASS OCCURRENCE MECHANISMS IN ASOKAI: FOCUSING ON SEDIMENT OXYGEN DEMAND AND FACTOR

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Sediment oxygen demand (SOD) was measured in a closed brackish lake: the Aso Sea. Factors influencing SOD were analyzed. After SOD measurements, dissolution tests were also conducted in stationary conditions. The elution rates of nutrients were also measured. Results show that SOD (1.21-1.71 gO/m²/day) values of sediments, which were 1.5-3 times higher than those of Lake Biwa sediments, were affected by oxygen consumption of hydrogen sulfide and organic matter in the sediment. Additionally, results demonstrated the necessity of considering these comprehensive dynamics in SOD estimation because the effects of material behavior on SOD were also evaluated. However, the TP dissolution test results show that the water exchangeability (fluidity) between the sediment pore water and water phase above the sediment greatly involved dissolution characteristics. Results also demonstrated that elution of PO₄-P was slower than that of NH₄-N because of the progression of reducibility. Its maximum value was found at the deepest site of the lake in both summer and winter.

Keyword: anoxic, sediment elution, water pollution, sediment oxygen demand

P3-39 VARIABILITY IN BOTTOM-WATER DISSOLVED OXYGEN CONCENTRATION IN LAKE INAWASHIRO

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The increase in chemical oxygen demand (COD) in Lake Inawashio has become more marked as the pH has neutralized starting in the mid 1990s. As an increase in COD suggests an increase in organic matter concentration, there is concern of reduced dissolved oxygen (DO) concentration in the bottom water during the stratified period. In this study, water temperature and bottom-water DO were continuously monitored. In the center of the lake, the bottom water was not extremely hypoxic in the presence of the thermocline, but one month was required for the bottom-water DO to recover after turnover of the water column. Across all observation points, the bottom-water DO was lower with deeper water depth, suggesting that there was a mass of water with low DO at the deepest point of the lake.

Keyword: hypoxia, water pollution

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P3-40 SURVEY ON MEASURES FOR THE CONSERVATION OF LAKE WATER QUALITY RELATING TO BOTTOM LAYER DISSOLVED OXYGEN AND COASTAL TRANSPARENCY

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In terms of aquatic environments in Japanese lakes, there are several issues such as remaining at the same level of the achievement rate of the Environmental Quality Standards for Water Pollution, low oxygenation of lake bottoms, overgrowth of aquatic plants, and decline in native fish species. In response to these issues, bottom layer dissolved oxygen (DO) content and coastal transparency have been added to the Environmental Quality Standards for Water Pollution in 2017. The effective measures for the conservation of water quality for the new standards were studied through the model projects for the actual lakes and predictive calculation of water qualities conducted by the Ministry of the Environment. On the basis of these results, the preparation and publication of the guidance on measures relating to the added standards has been scheduled to improve the achievement rate of the Environmental Quality Standards for Water Pollution, and to realize desirable lake aquatic environments. In this survey, the simulation model was built in order to analyze the factors influencing bottom layer DO depletion and evaluate the effectiveness of measures for the conservation of lake water quality. The constructed model was applied to the six lakes with different origination and usage, and the reproducibility and versatility were confirmed.

Keyword: hypoxia, Coastal transparency, water quality management, Simulation, Factor analysis

P3-41 FORMATION AND DECOMPOSITION OF POLYMERIC SILICATE IN PORE WATER

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Dissolved silicate is easily adsorbed onto ferric hydroxides and then is semi-permanently buried in sediment. In some lakes, the dissolved silicates seasonally increase with hydrogen sulfide, as the silicate is eluted from ferric hydroxide by its reductive dissolution. In this geochemical process, we found that polymeric silicate (PSi) was detected in freshwater lakes, but was not in brackish lakes. Accordingly, we assume that the main source of PSi in the pore water is ferric hydroxide adsorbing silicates. Another major factor controlling PSi content is NaCl concentration, as this salt is the most abundant component of brackish lake water.

We examined polymerization mechanism of silicate and the effect of NaCl on PSi decomposition. After leaving a test solution (0.6 mM monomeric silicate (MSi), 0.3 mM Fe³⁺, 0 M NaCl and pH 7) for 1 month, precipitate and filtrate 1 (F1) were obtained and then the precipitate was made to react with a Na₂S solution (pH 7). After 1 day, we collected Filtrate 2 (F2) and measured the MSi and PSi of F1 and F2. PSi was only detected in F2 and its concentration was 0.2 mM. Thus, NaCl was added to natural pore water, which was found to contain PSi. Most of the PSi was decomposed to MSi after 8 days. From these results, it can be concluded that PSi is formed only at freshwater lakes but is not at brackish lakes. Because its formation is inhibited by the presence of large amounts of NaCl.

Keyword: Polymeric silicate, Pore water, Ferric hydroxide, Sodium chloride, Freshwater lake

P3-42 ASSESING THE HEAVY METAL CONTENT OF GOLDEN APPLE SNAIL (*POMACEA CANALICULATA*), WATER AND SEDIMENTS AFTER FISH KILLS INCIDENT IN LAKE MAINIT, NORTHEASTERN MINDANAO, PHILIPPINES

Rainer Percy Sularte

Caraga State University, Graduate School

Heavy metals specifically Lead, Copper, Manganese and Cadmium is one of the major toxicant affecting freshwater organisms particularly the Golden Apple Snail, *P. canaliculata* which is an invasive organism. This study assessed the heavy metal content of Golden Apple Snail, *P. canaliculata* (*Gastropoda:Ampullariidae*) water and sediments in surrounding areas of Lake Mainit. Collection of freshwater snail particularly the Golden Apple Snail, *P. canaliculata* was collected using Opportunistic approach and hand picking and all samples were subjected for acid digestion and Atomic Absorption Spectrophotometer (AAS) analysis. Results showed that Manganese (6.099 ± 0.436 ppm) followed by Copper (3.325 ± 1.884 ppm), Lead (0.995 ± 0.332 ppm) and Cadmium (0.068 ± 0.012 ppm) respectively is beyond the threshold level and exceeded the recommended safe limits set by the authorized agencies. Sediments in Manganese had a mean concentration 5.61 ± 0.206 ppm which is beyond the Recommended Safe Limits set by the standard of Food and Agriculture Office (FAO) which is ≤100 ppm. Among the four heavy metals Manganese had the highest mean concentration 0.583 ± 0.217 ppm in waters. Accumulation of heavy metals in aquatic organism particularly *P. canaliculata* was species dependent. Thus, strict monitoring of heavy metals particularly the Lead, Copper, Manganese, and Cadmium by Local Government Unit is highly encouraged to efficiently study the hazard and effect of these four heavy metals on the aquatic environs of said lake and general public welfare.

Keyword: Lake ecosystem function, water pollution, sediment release, water quality management, degradation

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

P3-43 ANALYSES OF MICROBIAL CONSORTIA IN WATER AND SEDIMENT SAMPLES OF TONLE SAP LAKE

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Tonle Sap lake in Cambodia is the biggest lake in Southeast Asia. It is estimated that this lake accounts for ca. 60% of domestic protein needs and more than 1 million people stay at the floating villages on the lake. However, they use the lake water directly without sufficient treatments. Therefore, they are under threat of unsanitary water environment. In this study, we investigated the microbial consortia in the lake water and sediment by using gene analyses. Based on the results of 16S rRNA gene quantitative PCR, bacterial concentrations of the sediment were approximate 10^8 copies·mL⁻¹ throughout the year. This concentration was about 10-100 times higher than that of water samples. The concentration of water sample in the dry season and rainy season were ca. 10^6 - 10^7 copies·mL⁻¹ and 10^5 - 10^6 copies·mL⁻¹, respectively. According to the result of next generation sequence (NGS) analysis, it was clarified that the microbial consortia in the sediment samples were totally different from those in the water samples of every season. By statistical analyses, it was revealed that in the rainy season (August) the diversity of microbial consortia was lower than that in other seasons. Moreover, by the cultivation method using specific culture method, *Escherichia coli* and coliform were detected from the lake water samples taken from the place near the floating village, but not from the place far from it. It is thought that only the lake water near the floating village might be contaminated by human activities.

Keyword: Tonle Sap lake, microbial consortia, pathogenic bacteria

P3-44 HORIZONTAL DISTRIBUTION OF SEDIMENT AND CHARACTERISTIC OF NUTRIENTS DIFFUSION IN LAKE KOYAMA-IKE

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In order to elucidate changes in sediment environment after brackishing and characteristic of nutrients diffusion in Lake koyama-ike, We surveyed horizontal distribution of sediment and characteristic of nutrients diffusion in laboratory experiment.

We analyzed bottom sediment of the whole area and compared to before brackishing. Sulfide increased obviously in deep area. TN decreased in the whole area.

We examined influence that overlying water condition causes characteristic of nutrients diffusion. Dissolved inorganic nitrogen Diffusion is increased due to high water temperature and high salinity, anoxia. Dissolved inorganic phosphorus Diffusion is increased due to high water temperature and anoxia.

These result suggest that anoxia of bottom water caused by halocline obviously contributed to increase amount of nutrients release.

Keyword: sediment, Nutrients Diffusion, Horizontal distribution, brackishing

P3-45 INHIBITION OF ANAEROBIC WATER LAYER FORMATION USING A MULTIFUNCTIONAL AERATOR INSTALLED IN HIYOSHI DAM

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Multifunctional aerators co-developed by the Japan Water Agency in 2009 were designed to simultaneously fulfill two main functions related to water quality: oxygenation of deep water layers to relieve anaerobic conditions, and promotion of circulation of shallow water layers to prevent algal blooms. In contrast, conventional aerators work effectively for either deep layers or shallow layers, but not both. Since the multi-functional aerators were developed, 10 have been installed in four dams in the Yodo-gawa River catchment, and in other dams in Japan and Vietnam. In this study, a field experiment was carried out at Hiyoshi Dam (Lake Amawaka, Kyoto Prefecture, Japan) in spring 2016 to examine the effectiveness of the aerator in preventing the establishment of anaerobic conditions in deep water layers. In the experiment, the vertical distribution of dissolved oxygen (DO) concentrations was measured around one of the aerators installed near the dam wall for a three-day period after the aerator was in operation. Time-series analysis of DO concentrations revealed that the oxygen transfer coefficient of the aerator was 10 to 20%, which corroborated the values predicted in our previous studies.

Keyword: dam, water quality control, anaerobic water, aeration, field experiment

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

P3-46 EVALUATION OF A NEW SIMPLE METHOD FOR MEASURING SEDIMENT OXYGEN DEMAND IN LAKE BIWA

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¹National Institute for Environmental Studies, ²Lake Biwa Environmental Research Institute

Sediment oxygen demand (SOD) is closely related to change in dissolved oxygen (DO) in the bottom layer of lake which is a new environmental standard for aquatic environments. In this study, SOD was measured in Lake Biwa (the southern and northern basins) using a new simple measurement method for SOD. This method uses undisturbed sediment cores and measures SOD more easily on a smaller scale than the existing methods do. Thus, it was applied to the measurement of SOD at multiple points in Lake Biwa. SOD measurement in the northern basin of Lake Biwa showed a seasonal variation during the study period (from May 2017 to February 2018). In the southern basin of Lake Biwa, SOD measurements were conducted at two environmental reference points to evaluate the difference between these points. Moreover, comparison was made between our method and an existing SOD measurement method using a large sediment core (inner diameter 11 cm, length more than 25 cm). As a result, it was confirmed that both the methods produced the same variation tendency. These results indicate that our new method will be effective to evaluate SOD at multiple points in the lake environment.

Keyword: sediment oxygen demand, lake, sediment, dissolved oxygen

P3-47 BIOTRANSFORMATION OF ARSENIC SPECIES BY PHYTOPLANKTON IN FRESHWATER

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Arsenic (As) has the detrimental effect on phytoplankton in numerous aquatic ecosystem. Extensive studies have been performed so far to understand the biotransformation and uptake mechanism of macro and micro level algal species. The influence of cellular growth stages of phytoplankton related to biotransformation of As species is insufficient. In this study, we observed the As uptake mechanism and biotransformation process by several phytoplankton species at different growth stages. It was observed that arsenic converted to inorganic arsenic and methylated forms mainly during the exponential growth stages of phytoplankton, while the methylation process became reduced at the stationary growth stage in the culture medium.

Keyword: phytoplankton, arsenic, toxicity, biotransformation, freshwater

P3-48 APPLICABILITY OF IODINE ACTIVATED CARBON FOR MAINTENANCE OF LAKES AND MARSHES IN GOOD ENVIRONMENTAL CONDITION

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We developed the activated carbon impregnated with elementary iodine (I₂) named IodAC that keeps long period its chemical activity. When we impregnated more iodine (ex. 1~10 wt%) to the activated carbon, IodAC shows strong anti-bacteria and -virus activities, especially anti-avian influenza virus one, and its activities continue long period. Anti-avian influenza virus activity of IodAC is much superior than that of slaked lime. On the other hand, when a small amount of iodine was impregnated to IodAC (ex. less than 0.1%~ppm level), this IodAC inhibits multiplication of the algae in the water; and in a closing water system, it inhibits not only appearance of blue-green algae but also its multiplication. Mechanisms of these activities are unclear yet, but IodAC impregnated with elementary iodine is presumed to partially inhibit photosynthetic reaction (maybe Calvin cycle) of the algae.

For maintenance lakes and marshes in good environmental condition, we are developing our study using iodine activated carbon.

Keyword: blue green algae, avian influenza, slaked lime, iodine activated carbon

Technical Session 3: Water Quality and Ecosystem Functions in Lake Environments

P3-49 ESTABLISHING A TOTAL MAXIMUM DAILY LOADS (TMDL) PLAN FOR EUTROPHIC RESERVOIR: TAKING SHIMEN RESERVOIR AS AN EXAMPLE

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Shimen Reservoir in Taoyuan, northern Taiwan, is the major water supply source for Taoyuan and partial New Taipei city area. However, its water quality has encountered eutrophication problem. In the past 20 years, 40% of observed water quality was in eutrophic state. While erosion was controlled and the sediment problem was mitigate, nutrient concentrations, especially the total phosphorous (TP), was still higher than standard concentration. The Environmental Protection Administration (EPA) in Taiwan has sought a complete watershed management plan to control TP from point and nonpoint pollution sources. In this watershed plan, Total maximum daily loads (TMDL) is the core concept to manage pollution sources. This study is to demonstrate the whole process of establishing the TMDL of TP for Shimen Reservoir, including onsite water quality monitoring, simulation modeling, pollution sources survey, and control cost analysis. A TMDL control boundary and the pollution reduction strategy for both point and nonpoint sources were suggested. The predict performance was also presented with verified models. In order to understand the nonpoint pollution sources concentration of agriculture, a complete storm water sampling plan was carried out in this study. The result of sampling shows that the export coefficient of total phosphorous of dragon fruit and bamboo is 18.52 mg/L and 28.84 mg/L, respectively. Moreover, the export coefficient of total nitrogen of dragon fruit and bamboo is 2.06 mg/L and 7.63 mg/L, respectively.

Keyword: Reservoir, Total maximum daily loads (TMDL), Storm Water Management Model (SWMM), best management practices (BMPs), Export Coefficient

Technical Session 4: Lakeside History and Culture

P4-1 REHABILITATION OF "FLOWING NET WITH RICE CAKE HUNT" AND "WIDE RECTANGLE NET HUNT" TO WATERFOWL

Kensuke Yamazaki

consultant (environment, tourism, folklore)

"Flowing net with rice cake hunt" and "wide rectangle net hunt" to waterfowl, are introduced using a case of lakes and marshes in East Kanto region, Japan. Legitimately, it was performed at Tega marsh (Chiba) and Kasumigaura (Ibaraki) until 1945. There is also cases at Sado island (Niigata, Japan sea) and Biwa lake (Shiga). The role of the public museum of Ibaraki and Niigata is big in folklore after new political system from 1945. There is preceding study from a natural history, history folklore and land water science. I also add approach with ornithology, political science, tourism economics and jurisprudence, and analyze current state and problem toward rehabilitation.

Keyword: culture, tradition, tourism, marine fishing industry, policy proposal

P4-2 OBSERVATION OF SPAWNING SEASON OF FRESHWATER PRAWN, *MACROBRACHIUM NIPPONENSE* AND A STUDY OF CULTURAL VALUES OF LAKE USHIKUNUMA

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Lake Ushikunuma, which has 6.5 km², is located in southern area of Ibaraki prefecture. The lake has rich and wide water plants zone along lakeside. In this study, the spawning season of freshwater prawn, *Macrobrachium nipponense* in this lake shows between mid May and late August. And it's suggested that some prawns spawn twice in a seasons and the existence of water plants at lakeside is necessary for mature female prawns of spawning or escaping feeding damage. Catch of prawn by fishermen belong to Lake Ushikunuma Fishery cooperative is estimated about 500kg per year, which all is for personal consumption. From a cultural point of view, there are many famous artists which lived around Lake Ushikunuma and created many works inspired by Lake Ushikunuma. We should see and feel real Lake Ushikunuma and consider the value of the ecological service of Lake Ushikunuma, then conserve the water plant zone along lakeside and landscape for our life.

Keyword: Fisheries, Culture, Ecological service, Utility of biomass

P4-3 LIVELIHOODS IN THE HIMALAYAN WETLAND A CASE STUDY IN HIGHEST LAKE IN THE HIMALAYA

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Nepal Wetlands Society

The splendid and picturesque Tilicho Lake is the jewel of the Nepal's Himalaya. Wedged in the Annapurna range the lake is situated at the altitude of 4919 m. Its area is about 4 km² (400 ha). The lake is the highest and largest high altitude wetland in the world. It is a closed glacial erosion lake. The lake remains frozen for 7 months and remains open only from June to October. Tilicho is the source of water for wildlife, pastoralists and tourists. Because of its location in the rain shadow areas, it is the only source of freshwater in the area. The Lake bears high spiritual and cultural values for Hindus, Buddhists and Lamaists (Nyingma sect) and go there for pilgrimage. Tilicho is habitats for the endangered fauna. They include snow leopard, blue sheep, musk deer, Himalayan thar, Pika, wood snipe, Bar-headed Goose, Ruddy Shelduck, common merganser and great-crested grebe. Medicinal plants, are endemic to the area.

Livelihood activities include the pasture for yaks and collection of medicinal plants such as Panchaunle, Jatamashi and Kutki. Others include trade and tourism. Recently skiing and cycling on the frozen lake, deep diving to a depth of 25 meters and mountain biking. Tilicho is fragile but free from direct human influences. Even then, it is facing the problem of climate warming, inclement weather, yak-wildlife conflict, spread of moraine, avalanches, high evapo-transpiration. These problems are directly implicating the lives and livelihoods of local people.

Keyword: Lake, Culture, Spiritual, Habitat

Technical Session 4: Lakeside History and Culture

P4-4 WHY DO LAKES LURE PEOPLES' MINDS ?

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Aiming at the restoration of a lake, it becomes essential to take the methodology of science, technology, management, finance, the law and administration all into account. The failure to recover good clear water despite the best efforts by researchers and government proves insufficient. Peoples' unspoiled simple ideas or religious faith are also crucial to achieve improvement in a lake. Citizens, fostering their minds to pour love into their lake, should be objective, not only through rational research, but also through philosophy, psychology, ethnology and religion. This paper focuses on, through quoting many examples from different eras and countries, comprehensive philosophical suggestions for restoring desirable aspects of lakes, following a transition of human consideration to lakes everywhere and citing the local society around Lake Kasumigaura, Japan and the SF masterpiece "Solaris" written by S. Lem for comparison.

Keyword: regional belief, folklore, philosophy, culture, lakes

P4-5 REGIONAL CREATION PROJECT UTILIZING SEAPLANE

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It is planning the local creation of Oyama, Miho Village, Ibaraki Prefecture, by building group utilizing Seaplane. Seaplane is one of the infrastructures used around the world. The reason is that it is possible to take off and landing water to many places at low cost. Infrastructure development is finished now in Japan, and access to solitary islands and depopulated areas is inadequate. Therefore, in Japan where there are many waters, I think that it is possible to benefit a lot by using Seaplane from now on. Therefore, the population was small, facing the water area, and targeted Miho village Oyama in Ibaraki prefecture as a site with which it is related to the seaplane. Here is the rich nature called Lake Kasumigaura and there is a background that the Navy Air Corps used as a train station for a Seaplane during wartime. We propose a group of building facilities derived from Seaplane Airplane Terminal and property of the site as one of the model plan.

Keyword: seaplane, architecture, infrastructure

Technical Session 5: Regional Activities and Matter Cycles

P5-1 EFFECT OF DENITRIFYING BACTERIA ON RICE PLANT GROWTH-PROMOTION UNDER LOW-NITROGEN INPUT CONDITION: INVESTIGATION OF RICE PLANT GROWTH AND MOLECULAR ANALYSIS OF ROOT-ASSOCIATED SOIL BACTERIAL COMMUNITY

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Excessive input of nitrogen fertilizer to agricultural fields caused eutrophication of adjacent river and water reservoir. To prevent nitrogen pollution in the aquatic environment, it is essential to decrease the extent of nitrogen fertilizer application. Inoculation with a denitrifying bacterium *Azoarcus* sp. strain KH32C, which was isolated from rice paddy field, to rice seeds promoted early growth of rice plant under nitrogen-deficient condition in a controlled environment. In this study, we examined the effect of strain KH32C inoculation in rice seeds on plant growth and root-associated soil bacterial community in paddy field without nitrogen fertilizer. We grew different cultivars of rice in two paddy field soils with distinctive nitrogen and carbon levels. Inoculation with strain KH32C resulted in the increase of rice plant biomass at early growth phase of Nipponbare under low nitrogen and carbon soil condition. The Zinc content also increased in KH32C-inoculated Nipponbare brown rice compared with non-inoculation control. Moreover, metagenomics analysis of rice root-associated soil bacteria showed that inoculation with strain KH32C influenced bacterial community structure in Nipponbare root-associated soil. Our results indicated that strain KH32C might be utilized as bacterial inoculant in low-nitrogen input paddy fields.

Keyword: Nitrogen cycle, Food production, growth-promotion, Rice, Soil bacterial community

P5-2 THE ANALYSIS BETWEEN THE SEDIMENTATION CHARACTERISTICS OF SHALLOW LAKE AND HUMAN ACTIVITIES IN THE MIDDLE REACHES OF YANGTZE RIVER

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Lake sediments could record the sedimentary environment and invert environmental changes, especially in shallow lake. Environmental ²¹⁰Pb dating techniques were applied to determine recent sedimentation rates in a shallow lake named Honghu in the middle reaches area of Yangtze River, China. The results showed the recent sedimentation rate was 0.407~0.467g/(cm²·a) by the ²¹⁰Pb intensity and CRS model. Base on the ²¹⁰Pb intensity and CRS model, time-depth correlation was established. It showed that four periods with sedimentation rate during more than one hundred years. (1) A lower average sedimentation rate was about Natural deposits before 1900 year. And (2) The rate was slowly increasing from 1900 to the 1949 with the increasing population slightly. (3) During the times from 1949 to the 1980, the sedimentation rate was about increasing rapidly with the people's cofferdam activities. Because the improved medical technology leads to an increase in local population after new China established whose need more foods. The higher average sedimentation rate indicated that the impact of human activities increased significantly. (4) After the 1980, the variations of sedimentation rate change gently, which were in connection with natural changes, as well as the intensity of human activities on the catchment whose awareness of environmental protection have increased.

Keyword: ²¹⁰Pb dating, sedimentation rate, human activities, Honghu Lake

P5-3 LIFE CYCLE ASSESSMENT OF RICE CULTIVATION TECHNOLOGY: ASSESSING INFLUENCE OF NON-PUDDLING AND SPARSE TRANSPLANTING

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This study conducted a life cycle assessment of new techniques and approaches in rice paddy cultivation. We evaluated reclaimed land in Hachirogata, located in Japan's Akita Prefecture. Non-puddling cultivation is a technique of planting rice without the puddling. A rotary plow is used to plant the rice in finely crushed soil. Non-puddling allows a delay in irrigation. Thus, the soil is less likely to become deoxidized and a smaller amount of methane gas is released from the disturbed soil. Sparse planting is a technique whereby the planting stalk density is reduced by 30% (21 stalks/m² to 15 stalks/m²), thereby reducing the material costs of producing seedlings. We found that use of the non-puddling technique reduced overall GHG emissions to 69% of those produced by rice cultivation using puddling. In the puddling area, the discharge process from the paddy field contributes greatly. With sparse planting, GHG emissions were only reduced by a small amount to 93% of that of full planting. Analyzing the effect on eutrophication, the contribution of the discharge process from the paddy field is large in the puddling area. The eutrophication impact was also reduced in the non-puddling cultivation area, confirming that non-puddling cultivation contributes to improvement of the water quality environment. To reduce the impact on the environment, it is necessary to properly introduce these cultivations.

Keyword: Influence of wide area atmospheric environment, paddy field, greenhouse gas, eutrophication, lifecycle assessment

Technical Session 5: Regional Activities and Matter Cycles

P5-4 AN N-ALKANE $\delta^{13}\text{C}$ FOR ASSESSING SOURCES OF TERRESTRIAL ORGANIC MATTER IN LACUSTRINE SEDIMENTS IN CHINA

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Nanjing Normal University

To assess sources of terrestrial organic matter in lacustrine sediments in China, three sediment cores were collected from an area of several square meters in a small catchment. Results show 126 years of sediment deposition, from year 1885 to 2011. The accumulation rates ranged from 2.69 to 8.46 mm a⁻¹. All sediment samples were dominated by odd numbered *n*-alkanes (*n*-C₁₆-*n*-C₃₃), especially *n*-C₁₇, *n*-C₂₅ and *n*-C₃₁ as the most abundant homologues. Aliphatic hydrocarbon fractions are mainly composed of terrestrial higher plant-derived long-chain *n*-C₂₉ and *n*-C₃₁ alkanes. The most abundant compounds have been described as typical constituents of trees and shrubs (C₃ plants). The indicators indicate enhanced eutrophication resulted from increased anthropogenic activities in the Taihu watershed.

Keyword: lake sediment, organic matter, *n*-alkane, $\delta^{13}\text{C}$

P5-5 THE STUDY OF RUNOFF LOADS FROM LOTUS PADDY FIELDS AFTER INSTALLATION OF AGRICULTURAL INFRASTRUCTURE

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Lake Kasumigaura is the 2nd largest lake in Japan and within its basin, it hosts the largest volume of lotus root production in the country. The Teno area in Tsuchiura, Ibaraki Prefecture is also a center for a thriving lotus roots cultivation industry and was the first to develop infrastructure particularly the separation of irrigation and drainage canals in Japanese lotus paddy fields. This took place over the period from 1995 through 2015, and in this study, the authors researched changes in the Teno area compared to previous studies. In consequence, balanced losses from lotus paddy fields in year were increased compared to previous studies. These results were affected separation of irrigation and drainage canals in the lotus paddy fields. Because, separation of irrigation and drainage canals in the lotus paddy fields was decreased effect of soil sedimentation. However, balanced losses in the Teno area with its installed agricultural infrastructure was similar to that of other lotus paddy fields in Tsuchiura.

Keyword: Lotus paddy field, Agriculture, Balanced loss, Infrastructure development

P5-6 RECENT CHANGES IN THE VERTICAL DISTRIBUTION OF NITROGEN AND PHOSPHOROUS IN A BRACKISH LAKE OGAWARAKO OF NORTHEASTERN JAPAN

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Lake Ogawarako is a brackish lake located in a rural area of the east part of Aomori Prefecture, the northernmost part of the main island of Japan. There, eutrophication, which leads to the dominance of cyanobacteria, has become a big problem as is the case with other brackish lakes. To cope with this problem, we surveyed recent changes in the total amounts of total nitrogen (TN) and total phosphorous (TP) in the whole lake water (hereafter refer to ΣTN and ΣTP , respectively) and its vertical distribution from Oct. 2010 to Aug. 2017. ΣTN and ΣTP were 1092 ± 179 t and 109 ± 29 t, respectively. About 22-63% of ΣTN and 38-79% of ΣTP were distributed in the high-salinity layer of 15-21m, which composed only 13% of the lake water volume. TN and TP amounts in this layer largely varied temporally, suggesting that they were contributing significantly to the TN and TP amounts in the low-salinity layer. ΣTN decreased from 2015, and at the same time, halocline also deepened from ca. 15 m to 17 m. Therefore, it is considered that TN in the high-salinity layer were advected and diffused into the low-salinity layer, and outflowed from the lake. ΣTP tended to increase during the survey period. However, after typhoon events in Aug-Sep 2016, it dropped sharply, probably due to the flush out of massive amounts of water from the watershed and possibly due to adsorption of phosphate onto Andisol transported from the watershed.

Keyword: nitrogen and phosphorus cycle

Technical Session 5: Regional Activities and Matter Cycles

P5-7 EVALUATION OF AVAILABLE WATER RESOURCES AND NITROGEN RUNOFF IN NORTHEAST THAILAND

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In Northeast Thailand, the ratio of irrigated agricultural land is only 8% and others are rain-fed so that climate change makes agricultural production more unstable and also makes crucial damage to the societies and economics in local area. To mitigate these issues, it is desirable to develop and disseminate enhanced adaptation systems. In this study, water and nitrogen-load estimation model was developed and applied to Northeast Thailand. Both calculated river discharge and nitrogen load were good agreement with observed data. By using the proposed model, spatial distribution of available water and annual nitrogen load were estimated, and histograms of nitrogen load from each land use was evaluated.

In the future, climate change will accelerate the water cycle and severe droughts often occur in Northeast Thailand. Especially in dry season, nutrient concentration in large cities will increase due to the shortage of available water resource which dilute the nutrient concentration in drainage canal. And water environment in city will be degraded. Therefore, suitable sanitation system should be introduced to the city which have relatively large population density.

Keyword: TOPMODEL, Water balance, Nitrogen dynamics, Spatial distribution

P5-8 RELATIONSHIP BETWEEN NUTRIENTS AND ALGAL GROWTH POTENTIAL OF STORMWATER IN THE INBANUMA BASIN

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Public Works Research Institute

Algal growth in closed water bodies is one of the main factors of water pollution. Thus, to reduce water pollution, it is necessary to decrease the nutrient load in these water bodies. Even if the nutrient load of stormwater is known, its relation to algal growth in stormwater could be unclear. To understand which nutrients from stormwater contribute to algal growth, river water was sampled for stormwater at intervals of several hours during the rainfall period. For this sampling, four sites in the Inbanuma Basin, each differing in terms of land use, were chosen. At each of these sites, nitrogen, phosphorus, metal, and algal growth potential (AGP) were measured. The stormwater runoff characteristics of nutrients and AGP were studied at each site. The relationships among land use, metal concentration, and AGP were statistically analyzed. The results showed that the AGP load increased in basins with many plowed fields and decreased in those with high urbanization. Further, the correlations among Mg^{2+} , B, Ca^{2+} , and AGP were positive.

Keyword: point and non point source pollution, Inbanuma basin, stormwater, nutrients, algal growth potential

P5-9 BIOCHEMICAL POTENTIAL OF FRESHWATER, BRACKISH, AND SEA SEDIMENTS FOR REMOVING ANTIMONY FROM WATER ENVIRONMENT

Satoshi Soda, Keina Oka

Ritsumeikan University

Biochemical potential of sediment samples for removing antimony from water phase was evaluated. The sediment samples collected from Lake Biwa North and South Basins, Asoumi Sea (a brackish inland sea), and Wakasa Bay were suspended in 20 mL solution containing 100 mg-Sb/L as $K[Sb(OH)_6]$ under anaerobic condition at 28°C for 3 weeks. The sediment samples of Lake Biwa showed biochemical potentials for removing Sb from water phase by formation of orange precipitation (Sb_2S_3) although the Sb removal was low (10-30%). The sediment samples of Asoumi Sea and Wakasa Bay showed high biochemical potentials of Sb removal (80-90%) by formation of white precipitation ($Sb_2(OH)_3$). Bacterial colonies with antimonate-reducing and Sb_2S_3 -accumulating abilities were obtained from the sediment samples of Lake Biwa and Asoumi Sea. Bacteria with the biochemical potential for soluble Sb removal would be ubiquitously distributed in lakes and seas in Japan.

Keyword: antimony, bacteria, Lake Biwa, brackish lake

Technical Session 5: Regional Activities and Matter Cycles

P5-10 ELEMENTAL COMPOSITION AND MICROBIAL COMMUNITY STRUCTURE ANALYSIS OF SURFACE SOILS AFFECTED BY THE KANTO-TOHOKU HEAVY RAINFALL DISASTER IN SEPTEMBER 2015

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Kanto-Tohoku heavy rainfall disaster in September 2015 caused flooding of Kinu-gawa river, and sediment deposition affected soil ecosystem in its watershed area, especially in Joso city, Ibaraki Prefecture. In 2016, we collected surface soil samples from flood prone area and other area, and obtained information on their chemical properties and microbial characteristics. By examining elemental composition by XRF analysis, the amount of bacteria by dilution plate method, and soil microbial community structure by T-RFLP analysis, strong effect of flood deposit contamination of characteristics of soil microbes was revealed in this study. Collection of such data related to soil ecosystem will serve to know the solution for recovery of agricultural land affected by flood sedimentation.

Keyword: river flooding, microbial community structure, heavy metal pollution, Joso city, watershed management

P5-12 SCREENING OF SYMBIOTIC FUNGI ASSOCIATED WITH BEECH AND APPLICATION FOR TRIAL PLANTING OF BEECH SEEDLINGS IN THE ABANDONED CROPLAND AROUND KOMADO-SHITSUGEN MOOR

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The research of symbiotic fungi associated with beech and trial planting of beech seedlings were conducted in the area around Komado-Shitsugen moor, Fukushima, Japan. In this area, beech forest was reclaimed to cropland in 1950s and abandoned until 2000. Reforestation activity started from 2000; however, planted beech trees in some grassland area has been shown poor growth. Beech is one of ectomycorrhizal trees and is known to be associated with root symbiotic fungi. We studied symbiotic fungi associated with beech in different vegetation such as forest area, transit area and grassland area by observation of the number of ectomycorrhizal root tips in soil and colonization of ectomycorrhizal roots of the seedlings and isolation of symbiotic fungi from roots of the seedlings. As the results, the number and variation of morphotypes of ectomycorrhiza tended to decrease from forest area to grassland area. This result indicated the lack of abundance of ectomycorrhizal fungi in grassland area related to the poor growth of planted beech trees. We obtained 97 fungal isolates from surface-sterilized beech roots and selected 2 fungal isolates which supposedly associated with root both in forest and grassland area. To facilitate the growth of planted beech trees, we prepared fungal inoculums using these isolates, applied it to the young root of beech seedlings separately, and planted in the grassland area. The effects of selected fungi were evaluated by plant growth and chlorophyll content. Throughout this study, we will discuss the relationship among plant growth, fungal symbiosis, and soil environmental condition.

Keyword: abandoned cropland, wetland management, vegetation recovery, soil formation, beech forest

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-1 MONITORING AND EVALUATION OF THE WATER QUALITY OF TAAL LAKE, TALISAY, BATANGAS, PHILIPPINES

Felipe Buno Martinez

De La Salle University Dasmariñas

The study is an update on the physico-chemical properties of Taal Lake for local and government officials and non-government organizations. A total of nine (9) water quality parameters were monitored and analyzed. The study shows that Taal Lake's surface temperature, pH, total dissolved solids, total suspended solids, color, and dissolved oxygen content conform to the standards set by the DENR while phosphate, chlorine, and 5-Day 20°C BOD are below the standard. T-test result shows that there is no significant difference in the overall average of the two sites at Taal Lake ($P > 0.05$). Based on the data, the lake is safe for primary contact recreation such as bathing, swimming, and skin diving and can be used for aqua culture purposes.

Keyword: Cool dry season, hot dry season, rainy season, water quality

P6-2 ESTIMATE OF THE SALT WATER BALANCE AT THE GATE-CONTROLLED WEIR OF THE ABASHIRI RIVER

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Lake Abashiri, located at the east of Hokkaido in Japan, is a brackish lake that consists of two-layer system; the upper layer is fresh water and the lower one is anoxic salt water with highly rich nutrients. Rising of the top of the salt water layer in the lake, water-bloom or the blue tide sometimes occurred after the 1970s. The gate-controlled weir (Ohmagari weir) was constructed at the downstream section of the Lake Abashiri to control rising of the top of salt water layer in the lake due to seawater intrusion. It is necessary to estimate the salt water balance for appropriate use of Ohmagari weir. In this study, we investigated the characteristics of vertical salinity concentration profile by using self-recording salinometers at lake-ward (reverse) flow and seaward (forward) flow, and also investigated the vertical profile of streamflow by using ADCP deployed at the river bottom to estimate of the stratified salt water balance. As the results, the salt water wedge was observed while changing-over from lake-ward (reverse) flow to seaward (forward) flow. Compared the difference between total salt water balances that were calculated from salinometer records at several heights and from one certain height salinometer record, it was suggested that the salt water runoff was possibly overestimated as employing bottom layer records. We also suggested an optimal setting height of salinometer for higher-accurate estimate for the future based on sensitivity analysis of error rates in salt water balance calculated from each height salinometer record.

Keyword: gate-controlled weir, ADCP, salt water wedge, salt water balance, monitoring technique for river, lake, and marsh

P6-3 ESTIMATE OF THE FLOW VOLUME BY USING H-ADCP AT THE GATE-CONTROLLED WEIR OF THE ABASHIRI RIVER

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Lake Abashiri, located at the east of Hokkaido in Japan, is a brackish lake that consists of two-layer system; the upper layer is fresh water and the lower layer is anoxic salt water with highly rich nutrients. Water-bloom or the blue tide sometimes occurred by rising of the top of the salt water layer in the lake. The gate-controlled weir (Ohmagari weir) was constructed at the downstream section of the Lake Abashiri to control rising of the top of salt water layer in the lake due to seawater intrusion. It is important to estimate the flow volume to calculate of the salt water balance for the appropriate use of Ohmagari weir. In this study, we observed flow volume by using H-ADCP at Ohmagari weir when it was erected or prostrated, respectively. We also investigated sub-decadal changing of the measurement width with noise data in H-ADCP records for the successive accuracy management to estimate the flow volume using H-ADCP. As the results, H-ADCP could estimate accurately the flow volume calculated from vertical velocity profiles of Kasugaya formula with constant coefficients including the period when the weir was erected. H-ADCP could survey without noise data at width of the river 12-29 m stably over time. We also concluded that the consideration of changing effective measurement width depending on noise data derived from riverbed deformation is essentially more important than re-calibration of empirical coefficient of Kasugaya formula for successive accuracy management.

Keyword: H-ADCP, gate-controlled weir, tidal area, overflow weir, monitoring technique for river, lake, and marsh

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-4 ANALYSIS OF STATISTICAL METHODS FOR WATER-LEVEL FORECASTS OF NIGER INNER DELTA IN MALI

Barry Kassambara

MIE UNIVERSITY

Niger Inner Delta (NID) is a wetland that was selected as International Important Wetland under the Ramsar Convention (on February 1st, 2004) still can be considered as a hotspot of biodiversity in the Sahel. The Niger River as main source of water for the NID is also used for urban life and irrigation. Therefore, the sustainable use of water to ensure the environmental flow in the NID is under discussion. In this paper, we evaluate the performance of our model established with Water Balance Method (WBM) and make a comparison with different others approaches for the NID water-level forecasting. The result show that our WBM model present a good result very close to the Levenberg Marquardt Artificial Neural Network which is the best and much better than Multilinear Regression and Gaussian Process Regression models.

Keyword: Niger Inner Delta, water-level, wetland, simulation model

P6-5 ANALYSIS AND INVESTIGATION OF RIVERBED VARIATION MECHANISM FOR EFFICIENT AND EFFECTIVE LAKE MANAGEMENT

Hideyuki Ikeda

Ministry of Land,Infrastructure,Transport and Tourism Tohoku Regional Bureau Takasegawa River Office

Lake Ogawara is a brackish lake with abundant fishery resources such as *Corbicula japonica*, Japanese Icefish, Lake Smelt, etc. It is an important lake supporting the Aomori prefecture economy from the primary industry. The brackish water environment of Lake Ogawara is formed in a complicated balance such as the saltwater run through Takase River, the inflow from the tributary basin that flows into the lake, disturbance in the lake due to flooding, saltwater dilution and discharge.

In order to analyze the mechanism of riverbed change of Takase River and make it a basic material of preventive conservation river and lake management policy for efficient and effective lake management, tracer survey using colored sand was conducted. As a result, it was confirmed that the colored sand introduced into the downstream part (1.4 k) moved to the middle part in about two weeks due to the flow of backward flow at high tide and further reached the lake mouth mound after the winter period .

Keyword: Sediment movement investigation, Lake Environmental Management

P6-6 PARTICLE SIZE DISTRIBUTION OF SEDIMENT IN FISH NESTS AND POOL IN AGRICULTURAL DRAINAGE CANAL

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Distributions of soil particle size of sediment in fish nests and a fish pool an agricultural drainage canal in the Lake Kasumigaura basin, and those in water samples collected from the concrete drainage canal without those ecological structures as well, were analyzed. The median soil particle diameter in the fish nests were found smaller than that in the fish pool. The sediment in the pool comprised various sized particles ranging from fine sand to gravel. It is considered that the fish nests and pool create various sedimentary environment in the monotonous three-sided concrete canal.

Keyword: Fish nest, Fish pool, Sediment, Data analysis and modeling

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-7 ASSESSMENT OF HARMFUL CYANOBACTERIA GROWTH POTENTIAL BASED ON HYDRODYNAMIC MODELLING

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This study was conducted to assess harmful cyanobacteria growth potential based on hydrodynamic modelling with EFDC (Environmental Fluid Dynamics Code) in Bukhan river (Korea) through culture experiments using streambed sediment. Akinetes of cyanobacteria have settled down on the streambed sediment in areas of low water velocity. We monitored the five sites where particles are likely to deposit due to slow flow rate from result driven by hydrodynamic analysis. Akinetes or resting cells are estimated to be germinated or recruited from streambed sediment in April/May when environmental conditions such as flow rate and residence time are appropriate, and it is considered that they are deposited into streambed sediments after September when water temperature decrease.

Keyword: harmful cyanobacteria, growth potential, EFDC, streambed sediment, hydrodynamic modelling

P6-8 SIMPLE AND RELIABLE BIOLOGICAL MONITORING OF LAKES FOR SUSTAINABLE SERVICES

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Continuous monitoring of water bodies for multiple use such as drinking, fisheries, Horticulture, Agriculture, wildlife and Recreational activities are essential for the sustained quality of life.. Changing land use pattern in both urban and rural settlements in India are at the cost of water bodies and open spaces. Biological monitoring of water bodies using desmids, chlorococcales, diatoms and euglenoids are established methodologies which are cost effective, reliable and indicates ecological succession of water bodies. In this paper Chikkarasinakere in Maddur Taluk, Mandya district of Karnataka state, India has been monitored for four months in 2015 using phytoplanktons along with physicochemical parameters. The water quality has been assessed using Pearson's correlation matrix for physicochemical parameters and CCME WQI for biological monitoring of the water quality . Seasonal variations in the physicochemical and plankton diversity were observed. The abundance of diatom *Navicula cryptocephala* indicates organic pollution while *Synedra ulna* and *S. acus* are indicators of anthropogenic pollution. The water quality of the lake has been classified as poor for overall purpose such as drinking, aquatic and recreation and marginal for irrigation and livestock use. It is suggested that ecological succession of water bodies can be rapidly assessed by using micro biological parameters.

Keyword: Biological Monitoring, Multiple Water Uses, ecological succession, ILEC format

P6-9 ECOLOGICAL HEALTH ASSESSMENT OF LOEI RIVER AND TRIBUTARIES BY USING AQUATIC INSECTS UNDER RIVER CONTINUUM CONCEPT

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The study is aimed to investigate the environmental factors that influenced the living organisms based on functional feeding groups from the upstream to downstream in Loei River. The study sites were selected to 10 sites based on the impact of human activities along the river. The sampling were collected from February to June 2017 to represent all three seasons. A total of 27,702 individuals, belonging to 112 Families in 9 orders of macroinvertebrates were found. The most number of individual was mayfly in order Ephemeroptera, family Baetidae. The River Continuum Concept analysis of Functional Feeding Groups (Collector, Grazer, Predator and Shredder) based on principle of The River Continuum Concept indicated that the proportion of Functional Feeding Groups from separation the study sites including 1 to 3 (Upstream), 4 to 8 (Midstream) and 9 to 10 (Downstream). Therefore, the Ecological Health of Loei River is moderate to good level. In addition, there are also correlations in the statistical analysis based on changes in biological, physical and chemical in each month.

Keyword: river continuum concept, aquatic insects, Ecological health assessment, Loei River

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-10 SPATIO-TEMPORAL EVALUATION OF FLOOD IMPACTS ON WETLAND VEGETATION

Shara Grace Cosmod Astillero

Hokkaido University

Increase in sediment yield and nutrient-rich water in Kushiro Mire has intensified the vegetation in the area. Because of this, the wetland is becoming arid. It is therefore necessary to understand the preservation of wetland. As flood is relevant on the wetness condition of the wetland, preliminary investigation using satellite remote sensing data was conducted to spatially investigate the response of surface conditions to flood. Landsat 8 OLI TIRS and MODIS data utilized bands to acquire information on its conditions using the reflection and absorption to sunlight on the surface. This study aims to evaluate the response before and after extreme flood event. The variation of the surface condition response was quantified using spectral indices. The results show that there is a significant difference of response of the vegetation between non-flood and flood periods spatially. The results can provide helpful preliminary assessment for planning the restoration of Kushiro wetland.

Keyword: wetland, remote sensing, spatial assessment, spectral indices

P6-11 RELEASE OF THE SATELLITE-BASED LAKE AND RESERVOIR TEMPERATURE DATABASE IN JAPAN (SATLARTD-J) VERSION 3

Hideyuki Tonooka, Yudai Mizoguchi

Ibaraki University

The Satellite-based Lake and Reservoir Temperature Database in Japan (SatLARTD-J), released in July 2012, provides water surface temperatures around 10:30 am (JST) measured by thermal infrared bands of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) onboard NASA's Terra satellite, for 1,005 inland water bodies such as lakes and reservoirs in Japan (<http://tonolab.cis.ibaraki.ac.jp/SatLARTD/>). Because the mean frequency of successful measurements by ASTER for each water body is two or three times per year at most, SatLARTD-J also provides water surface temperatures regressively estimated with ground air temperatures from the Automated Meteorological Data Acquisition System (AMeDAS) in a five-day interval, using a regression equation obtained for each water body between the ASTER's water surface temperature and the AMeDAS ground air temperature corrected in spatial, temporal, and elevational. The version 2 of SatLARTD-J, released in July 2014, provided water surface temperatures only for a limited period from March 2000 to December 2013, but the latest version 3, released in January 2018, has a new function of near real-time updating, and the recent water surface temperatures for each water body are automatically added to the database. Water temperature is a key environmental factor for ecosystems in an inland water body, and the SatLARTD-J is expected to give some contributions to various fields including biodiversity conservation. As a next step, we are currently developing the world version of SatLARTD for future release.

Keyword: monitoring technologies for lakes and/or rivers, lake basin databases and knowledgebases

P6-12 IMPROVEMENT OF HYDROLOGICAL AND HYDRAULIC MODEL BY APPLYING SATELLITE-BASED PRECIPITATION IN THE TONLE SAP LAKE

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The Tonle Sap Lake in Cambodia is the largest fresh water lake in Southeast Asia. The diverse ecosystems of the Lake provides huge amount of fresh water and foods to humanbeing, animal and plants. However, hydrological and hydraulic conditions of the lake are changing by climate change and hydropower production in the upstream of the Mekong River. Hydrological and hydraulic models are powerful tools to understand these situations. Due to poor measuring density of gauge-based precipitation in Cambodia, the satellite-based precipitation GPCP is used in this paper with an objective to improve the reproduction accuracy of hydrological and hydraulic model of The Tonle Sap Lake basin in Cambodia. Since original GPCP tend to be larger value than gauge-based precipitation, bias adustment was carried out and then inputted to hydrological and hydraulic model. Nash-Sutcliffe efficiency (NSE) was used for the accuracy evaluation. Evaluation factors are precipitation, runoff discharge from each watershed to the lake and water level at Kg.Luong, which is a representative water level station of the lake. The findings are as follows. 1) NSE of GPCP before and after adustment against gauge based rainfall was improved from 0.043 to 0.748. 2) By replacing gauge-based pricipitation to adjusted GPCP, the NSE value of runoff discharge from the Chinit River watershed was improved from 0.694 to 0.817. 3) NSE of water level at Kg. Luong was improved from 0.971 to 0.986 by replacing gauge-based precipitation to adjusted GPCP.

Keyword: Monitoring technology for the lake, Satellite precipitation, The Tonle Sap Lake, Hydrological and hydraulic model

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-13 SPATIOTEMPORAL VARIABILITY OF CHLOROPHYLL-A CONCENTRATION IN LAKE MALAWI USING MERIS DATA

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Lake Malawi is one of the most important lakes in Africa, due to its biodiversity and usefulness to the adjacent populations. However, some anthropogenic activities can threaten its water quality and ecosystem services. Lack of a systematic regular monitoring of chlorophyll-a (Chl-a) concentration, and understanding of its spatial and temporal variation are some of the drawbacks. In this study we propose the use of MERIS Level 1B data to monitor the lake's Chl-a concentration, and its spatial and temporal distribution. Using the NASA's standard OC4E_v6 algorithm for clear water, Chl-a concentration was retrieved, during the 2003-2011 period. The highest mean concentration ($> 1 \text{ mg m}^{-3}$) for the entire lake was found in 2003. Since then the values dropped to a mean value below 1 mg m^{-3} . Nevertheless, the results showed a slight increase along the years although in small concentration. The Western and Southern part of the lake proved to be the most affected, having a mean Chl-a concentration around 5 mg m^{-3} , probably influenced by the anthropogenic activities in these areas, as the population pressure is high. The seasonal effects have also shown to have an influence in the Chl-a concentration, the highest concentrations were found in the first two seasons (November to April; May to August). It was also found that Chl-a concentration may differ depending on the location and season.

Keyword: Chlorophyll-a, Remote Sensing, MERIS, Lake Malawi

P6-14 UNMANNED VEHICLE ON WATER QUALITY MONITORING IN RESERVOIR

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Baoshan Reservoir supplies water to the Hsinchu Science Park in Taiwan, the high-tech wafer process requires a lot of pure water. Therefore, how to ensure the water quality and stability of Baoshan Reservoir is particularly important. Due to that Baoshan Reservoir is an off channel reservoir, it can select the water source from Shig-Ping Weir to avoid inferior quality water flows into Baoshan reservoir. There are many pollution sources because of prevalence of agriculture and a lot of residential buildings around Baoshan Reservoir. Monitoring the water quality of Baoshan Reservoir by unmanned vehicles, and establish the pollution hotspots to provide a scientific evidence to the reservoir management, and further set up appropriate pollution reduction facilities. At present, specific sites monitoring or manual sampling detection are the most common method in Taiwan. Manual sampling is time-consuming and can't be monitored over a long period of time. Specific sites monitoring can not be adjusted according to the level of water level monitoring points. As the specific sites monitoring can not represent the whole area of water quality, and there may be aquatic organisms and plant attached, the cost of setting up number of specific sites monitoring point will be too high. It can be effectively lower the cost by using unmanned vehicles equipped with direct reading instrumentation MAX-RS485 multiparameter water quality detector, the data can through the Internet of things back to the server, then remote control and give instruction to confirm the reservoir water quality changes and the source of nutrients.

Keyword: Water quality, Real-time monitoring, Unmanned vehicle, Internet of things (IOT)

P6-15 CONTROL OF ILLEGAL HUNTING BY USING DRONES IN ANZALI WETLAND IN IRAN

Tomoo Aoki, Hitoshi Watanabe

Nippon Koei Co.,Ltd.

One of the project activities supported by JICA under the Anzali Wetland Ecological Management Project - Phase II in Gilan Province, Iran, is to strengthen management capability for conservation of the wetland. Since many waterfowls such as wild geese and ducks come flying into the Anzali Wetland in winter, citizens are permitted to hunt them for food and recreation as an ecological service of the wetland. The hunting is permitted outside the protected areas of the wetland under limited license which is issued by Department of Environment of Iran. However, in practice, due to the large 193 km^2 area of the wetland and lack of human resource, capability, equipment, and budget for the rangers, illegal hunting activities are occurring both outside and inside of the protected areas. We will report on utilization of drones as conservation management tools for detection and monitoring of the illegal hunting and hunting nets hidden in the reeds.

Keyword: Ramsar Convention, drone, monitoring, control of illegal hunting, protected area management

Technical Session 6: Monitoring Based on Scientific Knowledge

P6-16 LCMSMS DETERMINATION OF ANTIBIOTICS AND HORMONES AND ITS APPLICATION IN LAKE WATER MONITORING

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University of the Philippines

Many water contaminants are relatively stable and are not completely removed during wastewater treatment and post-discharge processes. In this study, a fast and sensitive LC-MS/MS method was optimized for the direct analysis of trace antibiotics and hormones in water. Water samples taken from Laguna Lake (Philippines) were filtered and analyzed without enrichment. The chromatographic separation was done using a C18 column and gradient elution of water-methanol with 0.10 % formic acid or 0.10 % ammonium hydroxide. Detection and quantitation were done using multiple reaction monitoring. The detection limits were 0.01-0.42 µg/L for the antibiotics and 0.01-0.07 µg/L for the hormones. Correlation of determination was >0.98 for each analyte in 0 to 100 µg/L concentration range. This method is suitable for routine monitoring of water contamination considering detection capability, sensitivity and specificity. Preliminary analysis of lake water samples from nine sampling sites in Laguna Lake shows that these antibiotics and hormones are not detected. Determination of the occurrence of these emerging contaminants is important particularly in the use of the lake for aquaculture and potable water production. Monitoring potentially harmful water contaminants in lakes is important especially in areas where the implementation of environmental policies is still a challenge.

Keyword: water quality, water pollution, monitoring techniques for lakes and/or rivers, water quality instruments, water quality management

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services**P7-1 EFFECTS OF ORGANIC POLLUTANT FROM ANAEROBIC DIGESTATE ON SOLUBILITY OF POLY-BROMINATED DIPHENYLETHER IN AQUATIC ENVIRONMENT**Chen Shi^{1,2}, Yong Hu¹, Takuro Kobayashi¹, Hidetoshi Kuramochi¹, Kaiqin Xu¹, Zhenya Zhang²¹National Institute for Environmental Studies, ²University of Tsukuba

In this research, two kinds of typical polybrominated diphenyl ethers (PBDEs) were selected as the target pollutant and their aqueous solubility in the presence of two dissolved organic carbons (DOCs) from two different anaerobic digesters (35 °C and 55 °C) were measured. In the solubility experiment, a wide range of DOC strengths based on the chemical oxygen demand (COD) concentration was used. From the linear relationships between PBDE and DOC concentrations through 48 hours equilibrium experiment, furthermore, the partition coefficients (K_{DOC}) of the two PBDEs between water and individual DOC were determined. The results revealed that K_{DOC} at the thermophilic condition ($K_{\text{DOC}} = 0.0114$) was 10 times higher than that at the mesophilic condition ($K_{\text{DOC}} = 0.0011$), suggesting that the solubility of PBDE was affected by the DOC sources in the environment.

Keyword: chemical material, polybrominated diphenyl ethers, dissolved organic carbon, partition coefficient, aquatic environment

P7-2 THE INFLUENCE OF TOTAL SOLIDS CONCENTRATION ON THE PERFORMANCE OF ANAEROBIC DIGESTION OF FOOD WASTEYong Hu¹, Takuro Kobayashi¹, Chen Shi^{1,2}, Kai-Qin Xu¹¹National Institute for Environmental Studies, ²University of Tsukuba

Proper treatment methods for wastewater from food waste (FW) disposer have become very important in water quality protection and watershed management. In this study, an integrated system of siphon-driven self-agitated anaerobic reactor (SDSAR) and anaerobic filter (AF) reactor was conducted for the treatment of wastewater from FW disposer, and the effect of influent total solids (TS) concentration on the process performance was evaluated. When the influent TS concentration increased from 6.8 to 15.5 g/L, the influent COD increased from 14.4 to 35.5 g-COD/L/d, while the methane gas production rate also increased from 0.46 to 0.92 L-CH₄/L/d. On the other hand, when the TS concentration of FW further increased to 23.8 g/L, a large amount of scum formed and accumulated in the SDSAR. According to the result of COD recovery, the proportion of COD remained in the effluent at different dilutions ratios was only around 2%. However, with an increase in TS concentration, the proportion of COD remained in the reactors increased sharply. It was found that the influent TS concentration play an important role in a stable methane fermentation.

Keyword: biomass, methane fermentation, self-agitated anaerobic reactor, anaerobic filter

P7-3 VERIFICATION ON AOSD CONTROL SYSTEM AS ELECTRIC POWER REDUCTION SAVING ENERGY /ADVANCED WASTEWATER TREATMENT TECHNOLOGY IN VIETNAM AND SPREAD FOR ENVIRONMENTAL RESTORATION IN ASIAN AREAS

Yuhei Inamori

Foundation for Advancement of International Science

The AOSD (Automatic Oxygen Supply Device) system is the latest environment renovation system which supplies only the necessary quantity of oxygen of the microorganism in the advanced sewage treatment under the electric power reduction. It also contributes to COP21 including a basin of lakes and marshes. In this process, optimal oxygen amounts required for organic matter removal, nitrogen nitrification-denitrification etc. are predicted by using some parameters such as water temperature and dissolved oxygen (DO), and efficiency of blowers and stirrers can be operated automatically. Ministry of the Environment of Japan, "Vietnam's sophistication of wastewater treatment and cost saving response control system dissemination project" is carrying out. By this project advanced BOD, nitrogen and phosphorus removal have been accomplished and verified with more than 50% electric power reduction in combination with AOSD system, simultaneously. We need to start the spread in Asian areas such as Lake KASUMIGAURA basins.

Keyword: Countermeasures for Domestic Wastewater, Affordable Technology for Developing Country, Water purification and Wastewater Treatment technology, Software Technology, Monitoring System

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services

P7-4 NUTRIENT REMOVAL PERFORMANCE IN A CONSTRUCTED WETLAND USING MODIFIED BIOCHAR AS A BED-FILTER

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Nutrient removal performance in a constructed wetland using modified biochar, which has a high monovalent anion exchange capacity, was studied. Moreover, the performances of two influent feeding modes-tidal flow and horizontal subsurface flow-were compared. *Zizania latifolia* dominated in constructed wetlands with modified biochar and grew better in the horizontal subsurface-flow constructed wetland, which had a constant water level. Modified biochar effectively removed NO₃-N, whereas removal of NH₄-N was assumed to be due to plant absorption. Nitrification progressed better in the tidal-flow constructed wetland than in the horizontal subsurface-flow constructed wetland.

Keyword: constructed wetland, nitrogen, biochar, tidal flow

P7-5 CHARACTERISTICS OF NITROGEN AND PHOSPHORUS REMOVAL TYPE ONSITE WASTEWATER TREATMENT SYSTEM AND APPLICABILITY TO FOREIGN COUNTRIES

Yosuke Tabata, Kazuya Tanaka, Tsuyoshi Ichinari, Masashi Goto

Fuji Clean Co., Ltd.

Small-scale onsite wastewater treatment plants are widely used as decentralized wastewater treatment systems in sparsely populated areas of Japan. The Fuji Clean CRX II model has been developed in Japan as an enhanced nitrogen and phosphorus removal system using an iron electrolytic process. The structure, function and mechanics of the CRX II model is introduced along with performance data from grab samples taken from 27 actual sites. The result showed high treatment performance, suggesting that the CRX II model is an effective option to protect water resources worldwide.

Keyword: domestic wastewater control, nitrogen removal, phosphorus removal, iron electrolysis

P7-6 NUTRIENT REMOVAL FROM DOMESTIC WASTEWATER BY JOHKASOU IN WATERSHED OF LAKES

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The removal performance of nutrient (nitrogen and phosphorus) by actual *Johkasou*, on-site household domestic wastewater treatment facility was investigated in the watershed of Lake Inba-numa. The nitrogen removal type *Johkasou* showed better performance for BOD and nitrogen removal than the conventional *Johkasou*. The high performance of nitrogen removal type *Johkasou* was attributed to a mixed liquor (after aerated) circulating system for denitrification. However, phosphorus in the effluent from nitrogen removal type *Johkasou* was not different from that of conventional *Johkasou*. Therefore, in order to reduce phosphorus from *Johkasou*, the phosphorus removal pellets which recently developed were put into various types *Johkasous*. When 400 g of phosphorus removal pellets were placed in the *Johkasou* in one week, total phosphorus (T-P) and orthophosphate (PO₄-P) in the effluent from various types *Johkasous* decreased. By using these systems the *Johkasou* is able to remove nutrient from domestic wastewater in areas not provided with a public sewerage system in watershed of lakes.

Keyword: domestic wastewater, nutrient removal, Johkasou

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P7-7 SUMMARY OF ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM AND PERFORMANCE EVALUATION OF WASTEWATER TREATMENT TECHNOLOGY

Naohiro Kishida, Toshihiko Otsuka, Susumu Asakawa, Yuji Noguchi

Saitama-ken Environmental Analysis and Research Association

In an environmental technology verification program, performance of environmental technologies is evaluated by third party organizations for the purpose of helping spread of the technologies. In the field of organic wastewater treatment technology, one of the fields of the environmental technology verification program, performance (removal efficiency) of wastewater treatment equipment is evaluated by comparing polluting load of the influent with that of the effluent. However, it is difficult to investigate the polluting load accurately by general methods based on water sampling and quality analysis because flow rate and pollutants concentration of wastewater discharged from small restaurants, food factories and others fluctuate markedly. In this paper, we introduce composite water sampling method and evaluation method using loading unit that are adopted to solve the problem.

Keyword: drinking and wastewater treatment technology, technology verification, performance evaluation

P7-8 REMOVAL OF LINEAR ALKYL BENZENE SULFONATE BY VERTICAL FLOW CONSTRUCTED WETLANDS

Daisuke Inoue, Daiki Fujii, Masashi Kuroda, Michihiko Ike

Osaka University

Linear alkylbenzene sulfonate (LAS) is an anionic surfactant. Because of wide use as household detergent, LAS is a major pollutant in domestic wastewater. In addition, LAS can pose toxic effects on aquatic organisms such as fish and algae. Therefore, the Environmental quality standards for water pollution for the preservation of aquatic life have been set for LAS in Japan in 2013. This study examined the removal of LAS by constructed wetland, which is an environmental friendly and economically efficient wastewater treatment system and has been applied for removal of various organic and inorganic pollutants. Lab-scale experiments to treat LAS-containing model secondary effluent and river water was conducted by vertical flow constructed wetland systems consisting of column reactors packed with gravel and with and without planting common reed (*Phragmites australis*). The results revealed that LAS could be removed by the constructed wetland system, irrespective of the presence of common reed. Detailed studies also found that adsorption is the major mechanism of the removal of LAS, and that although the removal of LAS in the unplanted system declined with time possibly due to the adsorption saturation to gravel, high removal of LAS was maintained in the planted system, suggesting the improvement of LAS removing ability in the presence of common reed.

Keyword: domestic wastewater control, water purification and wastewater treatment, constructed wetland, linear alkylbenzene sulfonate

P7-9 ELUCIDATION OF THE INTRODUCTION EFFECT OF OIL-WATER SEPARATION EQUIPMENT BY GRAY WATER FOOTPRINT

Toshihiko Otsuka, Yuuji Noguchi, Naohiro Kishida

Saitama-ken environmental analysis & research association

Oil in the wastewater not only adversely affects the clogging of the sewage pipe and the biological treatment tank but also releases it to the public waters without being fully processed will cause organic pollution and cause bad influence on aquatic organisms and causes of malodors. So, environmental technology for reducing oil contaminated wastewater, keeping and/or improving the performance of the grease-trap, and reducing environmental load is currently developed and spreading of diffusion. This research aims to propose the systematic and evaluation methods to clarify the performance of the oil-water separation equipment as new technology installed to existing restaurant. WF_{grey} to evaluate the environmental impact of wastewater discharged outside the restaurant was analyzed. The environmental impact of the *n*-hexane extract index was reduced by 88.8% after the installation of the oil-water separation equipment from the viewpoint of the gray water footprint. More than 54.5% of the oil removal rate was established from wastewater while the number of the meals was increased in the assessments.

Keyword: Grey water footprint, oil-water separation equipment, environmental impact assessment, management based on carrying capacity

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P7-10 EFFICIENT AND SUSTAINABLE REMOVAL OF PHENOLIC ENDOCRINE-DISRUPTING CHEMICALS BY COMMON REED AND DEGRADING BACTERIAL ASSOCIATION

Tadashi Toyama, Tomoki Iwashita, Yasuhiro Tanaka, Kazuhiro Mori

University of Yamanashi

The efficacy of rhizobacterium (*Sphingobium fuliginis* TIK1) of common reed (*Phragmites australis*) for the sustainable treatment of phenolic endocrine-disrupting chemicals (EDCs) contaminated wastewater was investigated. Strain TIK1 had been isolated from common reed rhizosphere. Strain TIK1 degraded various 4-alkylphenols (4-*tert*-butylphenol, 4-*tert*-octylphenol and 4-nonylphenol) and bisphenols (bisphenol A, bisphenol F and bisphenol S). Thus, strain TIK1 has a wide degradation spectra for phenolic EDCs. The strain TIK1 utilized common reed root compounds as a sole carbon source and sustainably colonized common reed roots, where the strain degraded phenolic EDCs. In sequencing batch reactor experiments using common reed-strain TIK1 association (strain TIK inoculated common reed) completely and sustainably removed phenolic EDCs (bisphenol A, bisphenol S, 4-*tert*-butylphenol, 4-*tert*-octylphenol and 4-nonylphenol) from polluted wastewater. The results suggest that hydroponic systems using common reed-strain TIK1 association will be useful for sustainable treatment of polluted waters containing various phenolic EDCs.

Keyword: endocrine-disrupting chemicals, common reed, degrading bacteria

P7-11 POLLUTION OF WATER BODIES AND MITIGATION IN SRI LANKA

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National Water Supply and Drainage Board

Kelani River is one of the main rivers in Sri Lanka. Although not the largest in the country, this river is considered very important for the water requirements of Colombo, the capital city of Sri Lanka and its suburbs. The water needs include domestic, industrial, institutional, environmental and other needs. The water requirement from the Kelani River is increasing continuously due to rapid urbanization. Deterioration of water quality in the river creates adverse impacts on human health and to the socio economic development of the country. Due to the rapid development, most of these water bodies are being continuously polluted at an alarmingly increasing rate. These pollution sources mainly include point sources such as industrial discharges and uncontrolled sewage discharges and non-point sources of pollution which primarily include the storm water runoff from residential, industrial, commercial and agricultural lands. The analysis of the quality of river water revealed that it requires extensive purification before it is rendered suitable for drinking. Therefore, the people living along the coasts of Kelani River should be made aware about the chemical contaminations within the river basin resulting from anthropological activities, land use practices and industrial discharges. Harnessing the potential of the local community to play a more proactive role in preserving their own environment, as well as to communicate the overall message of preventing pollution in the Kelani River to other communities living in the vicinity, is a critical step forward.

Keyword: industrial waste, water bodies, water pollution, run off, land use practices

P7-12 IMPROVEMENT OF BOTTOM SEDIMENT QUALITY BY MAGNESIUM-BASED MATERIAL AND ENVIRONMENTAL APPLICATION

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Ube Material Industries,Ltd.

Magnesium-based materials obtained by reacting magnesium ions in seawater and an alkali source have been used as sediment improvement agents in aquaculture facilities in Japan , and are verified that it is safe for aquatic organisms. We verified of improving bottom sediments in enclosed sea areas using Magnesium-based materials under the ETV Program in 2016. For verifying of the effect of dispersing magnesium oxide, we formed Test areas (Dispersing) and Control areas (Non-dispersing) in the verification test. As a result, dispersing magnesium oxide allowed keeping the pH of bottom sediments at 8.5 or above (2 weeks after dispersing), reducing the amount of sulfides and hydrogen sulfide in bottom sediments, and stopping the decrease of benthic organisms in the Test areas compared with Control areas.

Keyword: harmful algal bloom, eutrophication, sediment release, in-lake restoration

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services**P7-13 SURVEY OF ANAMMOX BIOFILM IN ACTIVATED SLUDGE TREATMENT FACILITIES IN SWINE FARMS**

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Anammox is the newly discovered process that can remove NH_4^+ and NO_2^- and produce N_2 gas. It is expected to apply to swine wastewater treatment; however, it is not easy to obtain enough anammox biomass, due to its slow growth rate. In this study, swine wastewater treatment facilities were surveyed and biofilm including anammox with high concentration were found in 4 facilities. The biofilms included anammox DNA of 2.8×10^8 – 1.4×10^{12} copy/g-IL and anammox activity of 0.06–560 $\mu\text{mol-N}_2/\text{g-IL/hr}$. The highest concentration was as high as that of artificially enriched anammox sludge. Anammox biofilm existed in various kind of facilities, and dissolved oxygen concentrations in the aeration tank where anammox exists tended to be low concentration.

Keyword: livestock waste control

P7-14 ENHANCEMENT IN ENERGY CONSERVATION BY USING LIQUID-FILM-FORMING APPARATUS IN SHRIMP CULTIVATION POND

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The aeration process is widely applied to provide dissolved oxygen (DO) into the water for aquaculture to survive. Generally, the mechanical aeration on the water surface is commonly used in large-scale pond due to providing sufficient oxygen and mixing, however, it requires high energy. Liquid-Film-Forming Apparatus (LFFA) is a simple device which does not consume any additional energy besides the air pump for the diffused aerator. The large-scale experiment was conducted with the variety of installations to compare the oxygen transfer performance. It was found that the volumetric mass transfer coefficient provided from the paddle equipment was higher than that from the LFFA due to the strong turbulence for favorable mixing condition. However, in terms of power efficiency, the paddle equipment showed the lower of oxygen transfer power efficiency compared with the LFFA. This can prove that the LFFA system has an ability for energy-saving. Regarding the usage application in shrimp cultivation, even though the yield of shrimps in the LFFA pond was lower than that in the paddle pond, the power required for aeration was lower while obtaining the same amount of yield, indicating that the energy saving by using LFFA in the large pond was confirmed.

Keyword: liquid film, volumetric mass transfer coefficient, oxygen transfer power efficiency, shrimp cultivation, appropriate technologies for developing regions

P7-15 INFLUENCE OF POOR OXYGENATION OF THE BOTTOM LAYER OF LAKES ON REGROWTH OF ALGAE CELLS IN SEDIMENT

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The bottom sediment of the lakeshore roles functions as the origin of a supply for the phytoplankton, and the increased phytoplankton from the sediment greatly influences that is formed water quality. Poor oxygenation of the bottom layer water influence for deactivating for the storage phytoplankton cells in sediment and may adversely affect the water quality and plankton ecosystems. In this study, a photoplankton recurrence was tested based on dissolved oxygen content and its exposure time as parameters by using bottom sediment of the eutrophic Lake Yamanokami, Saitama Prefecture. As a result, the poor oxygenation of the bottom layer water can cause the phytoplankton community dominating by the blue-green algae. And it is necessary to be slightly an aerobic condition even if there are few the bottom layers of to maintain community structure.

Keyword: poor oxygenation, water bloom, phytoplankton, bottom sediment organification, lake littoral zone

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P7-16 ECONOMICS OF NON-POINT SOURCE POLLUTION CONTROL: AN OVERVIEW AND A PROPOSAL FOR A RELATIVE EVALUATION APPROACH

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Many of the wetlands are in closed water areas or semi-closed water areas where water circulation is less working and are suffered from Non-point source (NPS) pollution. It is well known that the traditional environmental policies could not be applied to the NPS pollution and therefore wetlands pollution has not been well improved for a long time. So far, a variety of NPS pollution control policies have been discussed in the environmental economic theory studies, though applications are still few. There still exists a major gap between environmental theory studies and the ongoing environmental programs for the NPS pollution control. In this article, we firstly overview the NPS pollution control policy studies and examine which NPS pollution control policies are relatively more realistic and show the better improvement for each type of wetlands under the different practical or physical constraints. After that, we also propose a tournament tax policy as the possible efficient NPS pollution control policy. By numerical calculations with the specified model for two polluters, we show the proposed policy satisfies the major properties such as 1) efficiency, 2) truth-telling, 3) budget-balancing, 4) collusion proofness.

Keyword: non-point source pollution control, environmental policy, relative evaluation

P7-17 DEVELOPMENT OF PRACTICAL EQUIPMENT ON PHOSPHORUS REDUCTION OF EUTROPHIC RIVER BY IRON ION ELUTION METHOD

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¹Fukken Co., Ltd. Consulting Engineers, ²Geo Design Co., Ltd., ³Get, Inc., ⁴Okasan Livic, Co. Ltd., ⁵Move Laboratory

Suppression of the generation of phytoplankton in eutrophic waters is an issue. Similar problems have also occurred in Lake Kasumigaura for many years. In 2013, Ibaraki Prefecture made a public proposal for a demonstration test on phosphorus reduction in a river flowing into Kasumigaura for 4 years. The middle scale verification tests (3m³ treatment tank) for reduction of phosphorus in river water were performed an annual average reduction rate of PO₄ P of 24.8 percent against the daily treatment flow rate of 43 m³ from 2013 to 2014. The large scale verification tests for reduction of phosphorus in river water were performed by eluting iron ion. The system was consisted of three treatment tanks of 25 or 30 m³ (10m³, 10m³ and 5m³) were developed based on a rolling dram cartridge system encapsulated iron eluting body (hereafter D material) of 384kg in order to elute iron ion continuously. The daily flow quantity of treatment water was from 100 to 300m³. The concentration reduction rate of soluble phosphorus (PO₄ P) of treatment water compared with raw water was recorded from 31 to 47 percent (larger than 30 percent of target value). Under the daily flow quantity of treatment from 400 to 550 m³, reduction rate of PO₄ P and TP were achieved 30 percent by improving the system with applying aeration and so on. DO and pH values of the treated water to be discharged into the river were within sufficient environmental regulations. Based on the result, Practical type of equipment are started from 2017.

Keyword: reduction of phosphorus in rivers, eluting iron ion, phytoplankton, practical equipment

P7-18 CONTAMINATION OF RIVER ECOSYSTEMS WITH HARMFUL ORGANIC CHEMICALS RELEASED FROM RECYCLING OF ELECTRONIC-WASTE IN NORTHERN VIETNAM

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Waste from end-of-life electrical and electronic equipment, known as e-waste, is a rapidly growing environmental problem worldwide. There is considerable interest in recovery of valuable and reusable materials from e-wastes for environmental and economic reasons. However, concerns were raised about environmental and human health risks posed by harmful organic chemicals, such as polybrominated diphenyl ethers (PBDEs) and their alternative flame retardants, associated with primitive recycling of e-wastes in developing world. We investigated contamination of river ecosystems with PBDEs and their alternative flame retardants released from processing of e-wastes in a village in northern Vietnam. On the basis of the obtained results, we determined concentrations of PBDEs and their alternatives in river fish and sediment samples and identified potential processes for contamination formation. Our findings suggested that open-storage of e-wastes should be prohibited and that wastewater treatment should be implemented at each workshop to reduce contamination of river ecosystems with harmful organic chemicals from recycling of e-wastes in developing world.

Keyword: River ecosystems, Chemical contamination, Electronic-waste recycling, Vietnam

Technical Session 7: Countermeasures and Technologies for Sustainable Use of Ecosystem Services**P7-19 EMPIRICAL STUDIES OF SEWAGE REPRODUCTION PROCESSING SYSTEM**Tomoya Nakamura

Nishihara Environment Co., Ltd

Effective utilization of sewage treated water is required as a water resource in cities, and it is necessary to ensure the safety of pathogenic microorganisms such as viruses and cryptosporidium remaining in sewage treatment water. Ultraviolet disinfection is characterized by space-saving and no by-products compared to chlorine disinfection, and it is considered promising as a method of securing safety. The disinfection effect of ultraviolet rays is indicated by the amount of ultraviolet irradiation, and its measurement depends on the biological dosimeter, but the problem with biosimetry by model viruses is that implementation is difficult if the scale of the apparatus is large. In an empirical study of a sewage regeneration treatment system, we focused on F-RNA phage among viruses in sewage treatment secondary water, examined its indexability, and demonstrated the safety and economic effectiveness of this system. In this report, we report the evaluation method of virus inactivation verified in the empirical research. In addition, this empirical research was conducted as a commissioned research from the National Institute for Land and Infrastructure Management between 27 and 28 years.

Keyword: sewage, virus, UV, Utilization and development of water resources, Water purification / wastewater treatment technology

P7-20 REMOVAL OF CHEMICALS IN SEWAGE TREATMENT PLANTS-IN THE CASE OF 1,4-DIOXAN-Takayuki Fujita, Masaya Shimizu, Kazuhisa Sugaya

Ibaraki Prefectural Kashima Sewage Office

Inflowing water at the Fukushima sewage treatment plant contains various chemicals discharged from plants mainly in the petrochemical industry. However, the indicator of the amount of organic matter is sufficiently lower treated water than influent water, and it is presumed that many chemicals are removed in the sewage treatment plant. Therefore, 1,4-dioxane, which is suspected of being carcinogenic and has low biodegradability, is selected as the substance to be studied from the chemicals contained in the influent of the sewage treatment plant, and mass balance and biodegradability test was conducted. As a result, it was suggested that the concentration of 1,4-dioxane was lower in outflow water compared with the inflow water in the reaction tank adopting the standard activated sludge method, and it was removed by microorganisms. Also, the removal rate of 1,4-dioxane in this sewage treatment plant was at least 30% or more, and exceeded 90% at the maximum. On the other hand, 1,4-dioxane removability was not observed in activated sludge of municipal sewage treatment plant. This study cleared that the activated sludge in the Fukushima sewage treatment plant has a unique chemical substance removing ability.

Keyword: Sewer, Chemicals, 1,4-dioxane, Wastewater Treatment Technology

P7-21 EVALUATION OF PARTITIONING POTENTIAL AND BIOACCUMULATION OF SEVEN SCCPS IN LAKE ECOSYSTEMZhenyi Zhang, Hidetoshi Kuramochi, Takurou Kobayashi, Kaiqin Xu

National Institute for Environmental Studies

Short chain chlorinated paraffins (SCCPs) have been listed in Stockholm convention as persistent organic pollutants (POPs). SCCPs are of great concern due to recently increasing detection in the environment, including lakes. Since the aquatic bioaccumulation is crucial in the food chain, there is potential risk of SCCPs to human health. In this paper, we evaluated the potential influence of seven SCCPs in lake eco-system, based on phase partitioning estimation between air, water and sediment, as well as the bioaccumulation calculation. The results indicated that the water is the main compartment for SCCPs with proportion of 51-71%. Multi-chlorinated SCCPs are favorable in sediment as well. The bioaccumulation factor (BAF) results indicated that the potential risk is higher in multi-chlorinated SCCPs. The variety of molecular structures of SCCPs would lead to different influence in lake ecosystem.

Keyword: Short Chain Chlorinated Paraffins, Phase Partitioning, Bioaccumulation

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P7-22 LAKE MANAGEMENT IN PRESENT AREA FOR ALL DEVELOPMENT

Natoi Allah Ringar

PHILOSOPHY OF ENVIRONMENTAL EDUCATION AND SPECIALIST IN PROTECTION AND DEVELOPMENT OF LAKE CHAD

terrorism, extreme poverty, wars on lake chad a heavy decline of lake chad cause a heavy decline of lake chad. Lake water decreases, fish die, hippopotamus and other animals in the water are on the run. the lake chad loses her place on the list of the big lakes in this area. it is urgent to present this situation before the world

Keyword: terrorism, lake water decreases, hippopotamus and other animal run, wars in lake chad, urgent

P7-23 AN ATTEMPT FOR IMPROVEMENT OF WATER QUALITY AND CULTIVATION OF PLANKTON BY CONDUCTING POLYMERS

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Planktons in the water system do not possess Ornithine cycle, resulting discharge of ammonia as a poison chemical in place of urea from the higher organisms. In the case of mass generation of planktons occasionally, mass production of the ammonia from the planktons makes worse in addition to a problem of exchange of oxygen and carbon dioxide in the environment. We have studied on conducting polymers. Half-doped state of the conducting polymers as a characteristic electronic state can neutralize ammonia without any negative effect against biological system. Here, we cultivate microorganisms and measure change in pH and ORP. We discuss possibilities for improvement of water environment system using this characteristic advantage of conducting polymers.

Keyword: Water environment, Electrical conducting polymers, ammonia

P7-24 NITROGEN REMOVAL UNDER LOW DISSOLVED OXYGEN CONDITIONS IN ACTIVATED SLUDGE TREATMENT OF SWINE WASTEWATER -RESULTS OF PILOT PLANT OPERATION-

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In the treatment of swine wastewater treatment that contains high concentrations of nitrogen, development of a simple nitrogen removal technique is required. In this study, pilot plants were operated, to confirm the improvement of nitrogen removal rate under low dissolved oxygen concentration in aeration tanks in the continuous aeration type activated sludge treatment. Two plants of 80 L scale were operated at different dissolved oxygen concentrations (low dissolved oxygen condition: average 0.48 mg / L, control condition: 2.86 mg / L) using pre-treated swine wastewater by solid-liquid separation.

The average of BOD and total nitrogen concentration (TN) of the influent water were 1,703 mg / L and 726 mg / L, respectively. The average BOD concentration of effluent and BOD removal rate were 188 mg / L, 92 mg / L, 86% and 93% in the low dissolved oxygen condition and the control condition, respectively, and the removal rate was significantly higher in the control condition than in the low dissolved oxygen condition. TN concentration of effluent and TN removal rate were 226 mg / L, 358 mg / L, 53% and 35% on average, respectively, and the removal rate was significantly higher in the low dissolved oxygen condition. It was shown that the nitrogen removal rate was improved by controlling the dissolved oxygen concentration in the aeration tank to a low concentration.

Keyword: Water purification / wastewater treatment technology, Wastewater regulation

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P7-25 SEWERAGE OF SHIGA PREFECTURE

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Shiga Prefecture

In Shiga Prefecture, advanced treatment has been introduced contribute to prevent eutrophication of Lake Biwa at all Wastewater Treatment Plants since opening of these plants.

Advanced treatment is not only conventional treatment for removing organic matter, but also removing nitrogen and phosphorus.

36 years has passed since opening of Konan-Chubu Wastewater Treatment Plant, We report history and present situation of Sewerage works in Shiga Prefecture.

Keyword: water pollution, eutrophication

P7-26 VERIFICATION EXPERIMENT FOR THE IMPROVEMENT OF AN ANOXIC BRACKISH LAKE

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¹Civil engineering research institute for cold region, ²Shimane University, ³Matsue doken

Lake Abashiri is a brackish lake in which there is a boundary between the underlying salt water layer and the overlying fresh water layer. Vertical water circulation in the bottom salt water layer tends to be suppressed, the anoxic condition of the bottom layer has become persistent, and hydrogen sulfide and nutrient salts have accumulated in high concentrations. When strong winds disturb the salt water layer, the substances in that layer are carried into the fresh water layer and cause the condition of the fresh water layer to deteriorate by causing water quality problems such as the abnormal propagation of algae and the occurrence of blue tides. Fishery is thriving at Lake Abashiri. Local fishermen have been suffering losses from the frequent water quality problems. To improve the water's anoxic condition and detoxify the toxicants, an oxygen supply experiment was done using an experimental plant constructed onsite with a Water Environment Preservation (WEP) system. The experiment verified that it is possible to increase the dissolved oxygen concentration to 40 mg/L and to oxygenate the hydrogen sulfide so that it becomes sulfur by supplying dissolved oxygen to the salt water. It was further verified that the orthophosphoric acid in the water decreased when water whose hydrogen sulfide had been completely oxidized was placed in contact with the bottom sediment. It was found that supplying oxygen does not affect the ammonium nitrogen.

Keyword: water quality improvement, anoxic, water environmental conservation

P7-27 DECOMPOSITION OF REFRACTORY CHEMICALS AND CHANGES IN THE NUMBER OF BACTERIA BY DISCHARGE REACTOR OF IMMERSION TYPE

Yuji Matsubayashi, Takeshi Yanagidaira

University of ibaraki

The performance of the advanced oxidation process using high voltage pulsed discharge is examined considering the influence on the microbes in the reaction vessel. Using pulsed creeping discharges of average power of 90 W for 5 to 30 minutes on a rotary electrode in water, the methylene blue pigment of oxidatively decomposed to a substance that can be biodegraded by microbes. The number of heterotrophic bacteria during the discharge treatment did not decrease greatly when the treatment time was within 20 minutes, and the viable cell count increased by two orders of magnitude in 5 days after the treatment.

Keyword: water purification and wastewater treatment, domestic wastewater control

Technical Session 8: Citizens' Activities and Environmental Education

P8-1 CITIZENS' MOVEMENT TO TACKLE WATER ENVIRONMENT PROBLEMS: 34 YEARS OF NATIONAL SUIGO-SUITO CONFERENCE

Toshihisa Asano

Hiroshima University

The 1st World Lake Conference (LECS'84) was carried out by collaboration of administrative officers, researchers and citizens against the background of criticism to water resource development and lake eutrophication. After the LECS'84, a network linking various stakeholders was made. That is National Suigo-Suito Conference. The first meeting was held in Matsue City by Lake Shinji at the next year of LECS'84. After that, the National Suigo-Suito Conference has been continued for 34 years. In the meantime, the focus of a water environmental problem has not only been placed on environmental destruction by public works or pollution, but has come to be placed on biodiversity, a recycling society, environmental education, environmentally friendly communities, and so on. On the other hand, social evaluation of citizens' movement has changed. In Japan, a volunteer activity and citizen participation came to be evaluated highly after the middle of the 1990s. The social status of civil movement organization is improving. However, the National Suigo-Suito Conference came to hold some problems, such as reduction of the number of participants or member's aging in 34 years after the establishment. In the present condition that it is easier for a civil movement organization to collect the information of other organizations and to collaborate each other by the development of ICT, the *raison d'être* of the national organization which aims at "loose" solidarity of the many resident's organizations must be reconsidered.

Keyword: citizen participation, nature conservation, collaboration, basin governance

P8-2 CLEANING ACTIVITIES IN LAKE KASUMIGAURA AND FUTURE PROSPECTS

Kenji Saito

NPO WATERSIDE BASIS SOCIETY

Even if underestimated, over 157 tons of garbage have been collected from Lake Kasumigaura by our waterside cleanup activities organized by the Waterside Basis Society.

Most of them are litter garbage dumped illegally by watershed residents.

Even though I would like to enjoy fishing I love mostly in Lake Kasumigaura, many visible garbage will spoil our pleasure. The cleanup activities have been continued with the motivation to fish in a beautiful environment, but now it is made up of cooperation with government agencies and private organizations.

However, we are always suffering from financial difficulties for continuing our activities. A cost is incurred to pick up garbage and also to process them. In addition, there are a lot of tasks to continue long-term activities, and we are confronted with a tough phase just by sincerity of volunteer participants.

In this paper, I describe the reason why we started picking up garbage, how we are doing activities, problems on activities and future tasks.

Keyword: Collaboration, Conservation of nature, Citizen participation, Waterside contact, Consciousness enlightenment

P8-3 AN URBAN POND RESTORATION AND PRESERVATION PROJECT BY COLLABORATION OF LOCAL COMMUNITIES

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Restoration and preservation of an urban pond has been conducted by collaboration of local communities including a non-profitable citizen group, the City, and educational institutions. Junsai Pond is one of the typical urban ponds located approximately 20km east of Tokyo. The urbanization in the watershed caused spring in the area to deplete and the pond is currently fed by groundwater. Though the pond is still accommodating more than 20 endangered species, water quality degradation made various water plants such as Junsai (*Brasenia schreberi*) and Inokashirafurusukomo ((CR+EN), *Nitella mirabilis* var. *inokasiraensis*) vanish from the pond. The purposes of our project are to restore habitat to support vanished aquatic plants and also to provide green space and waterfront access for the residents and migratory birds.

The factors and mechanisms that cause water quality degradation have been elucidated and the effects of several possible counter measures such as water aeration, emergent species vegetation, lowering water levels have been evaluated. We are currently in the process of designing the implementation of restoration measures.

The collaboration of local communities made it possible to effectively conduct wide range of activities including management of the pond, scientific investigation, and also various educational activities. On the other hand, it was found that the lack of support from specialists lead unwanted results. Our future issues would be getting proper support from specialists, cooperation with local schools in the process of restoration, and also obtaining funds

Keyword: collaboration of local communities, restoration and preservation, urban pond, aquatic plant, endangered species

Technical Session 8: Citizens' Activities and Environmental Education

P8-4 BIRDS SIGHTSEEING AS A STRATEGY FOR RAISING AWARENESS OF LAKE CHAPALA ECOLOGICAL IMPORTANCE

Claudia J Gonzalez, Alejandro Juárez Aguilar

Institute Corazón de la Tierra

Lake Chapala, the largest natural body of water in Mexico (1,140 km²) was visited and described by the famous German naturalist Alexander von Humboldt on his trip in 1803. Although it maintains great scenic values, the lake faces conditions of degradation and disappearance of native species due to lack of knowledge of its operation and the scarce engagement of the population on its conservation. A component of great relevance for the area of birds, in which there are registered 307 species (30% of the total for Mexico).

To promote interest in caring for the environment and encourage nature tourism, an Environmental Interpretation Trail was installed, which includes 7 observation points, where school groups and the public are attended. Specialized signage and a map for visitors with photographs and descriptions of the most common birds in the area are available, consistently pointing their importance and current situation; there is also a group of local guides trained to take care of the visitors. In a complementary way, environmental education workshops are held with primary and secondary students from the municipality of Chapala, and a media and social media outreach campaign, with a minimum impact on 20,000 people.

Participants' interest in the conservation of birds and their habitats is fostered to maintain environmental services, such as pest control, seed dispersal and pollination, and water quality. The project is the result of a careful planning process and was carried out within the framework of the Germany-Mexico Dual Year, promoted by the Goethe Institute.

Keyword: communication, awareness, citizen participation, nature conservation, recreation

P8-5 SUSTAINABLE NEIGHBORHOOD DESIGN IN WATERSIDE AREA :A CASE STUDY ON THE CONSTRUCTION OF FLOODWATER RETAINING BASIN

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Graduate School of Education, The University of Tokyo

The purpose of this study was to investigate the perspectives of sustainability of the community found in the plan of the Sustainable Neighborhood Design, a case study of the construction project of Hakoijima Floodwater Retaining Basin in the southern part of Chikusei city, Ibaraki prefecture. Houses that are located within the area designated as reserve are relocated as a group within the area of the floodwater basin area, and the new town "Asahigaoka" was built. However, the residents of Asahigaoka felt after 30 years from the completion of the project is "anxiety as a feeling" for sustainability, "Sustainable Neighborhood Design after the disaster" It was a negative evaluation that change could not be assumed. This means that the "Positioning of the Town in the Regional Ecosystem" that should be created in the design after the disaster has become unclear and it can be explained that this did not lead to the formation of the personality of the place, and the Practical Local Action currently underway indicate that "Sustainable Neighborhood Design after the disaster" has finally started in a real sense after one generation from relocation.

Keyword: community development, regional revitalization, cooperation, waterside, culture

P8-6 TRANSFORMATION OF CONSCIOUSNESS OF ENVIRONMENTAL PRESERVATION AFTER ENVIRONMENTAL LEARNING AT KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER

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We conducted a questionnaire survey on environmental conservation consciousness for children participating in the Shipping School for Environment Lessons conducted by Ibaraki Prefecture. The student experienced "outdoor observation", "observation of plankton", "water quality survey" at the Kasumigaura Environmental Science Center. We analyzed respectively the questionnaire survey results "Outdoor observation" had an effect on "responsibility awareness" "knowledge". "Plankton observation" had an effect on "responsibility awareness". "Water Quality Survey" had an effect on "responsibility awareness" "knowledge" "environmental conscious behavior".

Keyword: Consciousness of environmental preservation, Environmental learning, Environmental learning program, Ibaraki Kasumigaura Environmental Science Center

Technical Session 8: Citizens' Activities and Environmental Education

P8-7 HUMAN RACE IS PREPARING ITS OWN END! IS IT POSSIBLE TO SLOW DOWN?

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The human race trapped by the technology is not aware of the catastrophe that it has created because integration of its life with environment and nature has been destroyed. Every day, environmental conditions are getting worse as a result of the activities of human race and it is trying to find ways to tackle with challenges that climate change and pollution has caused. Is human race going to be successful in this fight? This is a hard question to answer. But there is a great truth which we should not forget that we borrowed this world from our children and our grandsons and we should leave a liveable world to them. By keeping in mind this truth, human race has to do its best to slow down negative changes in the environment.

Starting from this point, DSI, as being the major Turkish institution responsible for water resources development, has initiated the **Water Ambassadors Project**. The **Project** is aimed at awareness raising about effective utilization and conservation of water resources for the sake of future generations. The Project, developed by DSI, is being conducted by DSI together with Turkish Ministry of National Education and Turkish Radio and Television Corporation. Part of the project was realized via financial support of EU in 2017. A wide range of activities have been undertaken including cartoon series production, curriculum overview, orienteering competitions, stage performances, documentary production and establishment of a web TV.

If humans do not touch nature, nature continues to live for millions of years.

Keyword: conservation of water resources, awareness raising, Water Ambassadors, environmental education

P8-8 EXPERIMENTAL MATERIAL WITH WATER ROCKET FOR ENVIRONMENTAL DATA SAMPLING IN MIDDLE OF LAKE

Masaki Yokoyama

Workshop for Space and Environment Education

There are few convenient tools for data sampling in middle of lakes, except for boats. So, we invented a separation mechanics based on water rocket, which make sensing devices possible to transport toward middle of the lake. We promoted basic techniques as a sampling tool for environment education.

Keyword: curriculum development, capacity building, recreation

P8-9 OUTREACH USING "TOMBO POND" IN MUSEUM: EX-SITU CONSERVATION OF ENDANGERED SPECIES AND DISSEMINATION FOR NATURE CONSERVATION

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"Tombo pond" in Ibaraki Nature Museum is independent of the natural water system and is not exposed to the danger of human capturing pressure and contamination of alien species,

Keyword: drainage out of a pond, extermination of invasive alien species, ecosystem reservation, Outreach using museum pond

Technical Session 8: Citizens' Activities and Environmental Education

P8-10 ECOTOURISM FACILITY ASSESSMENT AND CONSERVATION PERSPECTIVES OF BOGA LAKE BY INDIGENOUS COMMUNITY

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¹University of Dhaka, ²Joint Secretary, Nature Conservation Society

Boga Lake, the highest mesmerizing natural beauty of Bangladesh; 2700 feet above the sea level. It is about 2000 years old hill enclosed natural Lake covering total 15 acres of land. The Lake is about 65 km away from the Bandarban town & 15 km away from Ruma Sadar Upazilla. The Lake is average 38 meters deep. Bagachara is the deepest part with 153 meters. There are small tribal communities: the Bawm, Tripura and Khumi located around the Lake. Along with the original inhabitants, Marma and Murong indigenous communities are also noticed on the way or in the surrounding areas of the Lake. The only way to the Lake by Chander Gari or a private vehicle, followed by boat riding and walk through the zigzag hilly way. Tourist can hire local tour guide from Ruma or Bandarban. On the way tourist have to register their details in the respective security camp of Army. Only 20 cottages with TK. 100.00 per person is the only way to stay in the Lake side area. Foods are also arranged by the cottages, mostly traditional Bengali or community special menu. The area is rich in biodiversity especially plant diversity. But due to the acidity of the Lake, there is no immediate vegetation on its banks and no fish was recorded in its waters either. Mostly the Lake is a unique beauty, pristine and heritage only because of the conservation practices of community people with belief and sustainable resources use which promotes conservation education values.

Keyword: Ecotourism, Boga Lake, Bandarban, Indigenous Community

P8-11 DEVELOPMENT OF ENVIRONMENT EDUCATION PROGRAM MADE USE OF THE DIVERSITIES AND LOCATION OF FUJI FIVE LAKES

Kazuya Yoshizawa

Yamanashi Institute of Public Health and Environment

In this study, I tried to develop the new environmental education program on lake water quality and ecosystem based on the Fuji five lakes.

Fuji five lakes are located in small area on the northern foot of Mt. Fuji which was registered as a World Heritage Site in 2012. This lake group consists of Lake Yamanaka, Lake Kawaguchi, Lake Shoji, Lake Sai and Lake Motosu with diversities in lake depth, lake size, transparency, coloration and so on. Because of the advantage of these lakes that we can observe the various lakes in a short time, it is considered that they will be a good field to learn the limnology and ecosystem of lakes.

Developed program is prepared for elementary school students, and consists of five stages; i.e. Giving a question, Learning on the ecosystem in lake, Observations on the water and livings, Simulation on ecosystem, Discussion.

As results of this study, several suggestions were made.

1) At the first stage of this education program, the question why these lakes have different transparencies and colorations in spite of lakes were located so closely is considered effective for introduction of learning.

2) Development of simulation methods, simulation application on computer or simulation game with cards for example, is considered effective to deepen understanding about Lake Ecosystem.

Keyword: Fuji five lakes, environment education, program, lake ecosystem

P8-12 WATER QUALITY RESEARCH AND WATER ENVIRONMENTAL SOUNDNESS INDEX ESTIMATION OF LAKE INBA(FY2012-FY2017)

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Lake Inba is a freshwater lodging swamp located in northern part of Chiba prefecture. Since the 1960s, the quality of the swamp deteriorated with the increase in the catchment population. It has been ranked in the worst five times in the swamp water quality nationwide. In this report, as part of the activities of the Institute of Environmental Science, Chiba Institute of Technology, we investigated the water quality situation of Lake Inba. By understanding the water quality characteristics of Lake Inba from the data for the six years from 2012 to 2017 and by conducting a survey based on the "Water Environmental Soundness Index", how people perceive and feel to Lake Inba changes. It was aimed at grasping what to do. According to the survey results for 6 years, the Mizukusaen tends to be more alkaline than the Furusatohiroba. COD fluctuates in summer and winter, but it has remained almost flat for 6 years. In addition, Lake Inba is a nitrogen-rich lake, so it is necessary to reduce nitrogen fertilizer flowing out from basin area. According to the Water Environmental Soundness Index, the score in comfortable waterfront parameters was slightly lower. But overall, viewpoint and way of thinking about Lake Inba have not changed significantly in these 6 years.

Keyword: Lake Inba, Water quality, Water Environmental Soundness Index, Environmental education, Circle activity

Technical Session 8: Citizens' Activities and Environmental Education

P8-13 THE RELATIONSHIP BETWEEN SEWAGE COVERAGE RATIO AND POLLUTANT CONCENTRATION FOR LAKE KASUMIGAURA AND LAKE SUWA

Masayuki Miyauchi

Kasumigaura Citizen's Association

We cannot say for certain when the water quality of Lake Kasumigaura will be improved, even though many people have made lots of efforts to improve it for more than 30 years. And, compared to 30 years ago, the quality of Lake Suwa has already been improved by the sewage coverage ratio rising and other countermeasures. So, the sewage coverage ratio rising at the Lake Kasumigaura Basin has been compared with that at the Lake Suwa Basin. And, the relationship between sewage coverage ratio and pollutant concentration (COD, T-N, T-P) have been compared between both lakes. Three, pollutant concentrations of Lake Suwa are declining while up and down until the sewage coverage ratio increases to 60%, and COD rapidly decreases for more than 80%. On the other, three, pollutant concentrations of Lake Kasumigaura do not show any decline for less than 65% sewage coverage ratio of the current level. However, when the experiences at Lake Suwa are taken into consideration, pollutant concentration of Lake Kasumigaura would be expected to begin decreasing for more than 80% of the sewage coverage ratio.

Keyword: Lake Kasumigaura, Lake Suwa, sewage coverage ratio, pollutant concentration, hysteresis

P8-14 EFFORTS FOR PURIFICATION OF WATER QUALITY IN LAKE USHIKUNUMA

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¹Environmental Management Division, Ibaraki Prefectural Government, ²Council of Water Quality Purification Measures in the Lake Ushikunuma

Lake Ushikunuma is a shallow small lake located in the southern part of Ibaraki prefecture, and it is a valuable asset of Ibaraki citizens such as use as agricultural water and fishing ground. However, since 1980, water pollution due to eutrophication has progressed, Ibaraki prefecture has applied lake environmental standards, and planned three times formulated a lake water quality preservation plan for 5 years, and has been promoting water quality improvement efforts. On the other hand, the Council of Water Quality Purification Measures in the Lake Ushikunuma, composed of municipalities in the Lake Ushikunuma basin and related land improvement zones and fishery cooperatives, has developed practical activities related to water purification. Although the population of the Lake Ushikunuma basin has increased dramatically due to large-scale development, the discharge load has been decreasing due to the maintenance of sewers. The population of Lake Ushikunuma catchment area will continue to increase. Therefore, in order to prevent the inflow of pollutants from increasing and to improve water quality, it is necessary for concerned groups and local residents to work on water quality conservation activities in cooperation.

Keyword: Lake Ushikunuma, environmental standards, water quality conservation plan

P8-16 EVOLUTION OF A HYBRID FRAMEWORK FOR ADAPTIVE WATERSHED GOVERNANCE IN A MICRO-WATERSHED SCALE LAGUNA DE BAY BASIN, PHILIPPINES

Adelina Santos Borja¹, Jocelyn Fabian Siapno¹, Rose Simon Bonifacio¹, Noboru Okuda²

¹Laguna Lake Development Authority, ²Research Institute for Humanity and Nature

There have been numerous watershed governance models developed for planning and managing natural resource projects. However, these models are generally applied in a macro scale discounting some vital social and environmental concerns that are peculiar in a local setting.

This paper will discuss the importance of focusing environmental conservation initiatives on a smaller scale, adopting and modifying applicable existing watershed governance framework and approaches. As a take-off point, Barangay Carmen in the town of Silang was selected in view of the existence of the Malindig Spring situated within the Malindig Micro-watershed. The said spring is important in the social-cultural and economic activities of the community. However, sustaining its ecological integrity is a challenge which necessitates multisectoral involvement coupled with the government's efforts in spearheading actions for community support. The need to identify a group of champions in environmental management is a key success factor in environmental management, thus, the women in Barangay Carmen became the target sector to take the lead in view of their interest and respected roles in the community.

The results of engagement with communities in a micro-watershed scale revealed the need to refocus the strategies in managing natural resources from a macro-scope to a micro-level scale. This will ensure a more efficient assessment of the socio-cultural-economic-environmental and political situation leading to more effective strategies in managing natural resources.

Keyword: watershed governance, collaboration, participatory planning, micro-planning, women empowerment

Technical Session 8: Citizens' Activities and Environmental Education

P8-17 ACTIVITIES OF "KOTOKU-NUMA NATURE PRESERVATION ASSOCIATION", THE WINTERING GROUND OF THE SOUTHERNMOST OF THE WHOOPER SWAN

Takashi Meguro, Shiro Iida, Hiroshi Akagawa, Giichi Haginoya, Mitsuo Okamura, Toshio Yamada, Makio Terakado
Urizura District Community Planning Committee

A lot of TAMEIKE (ponds for agriculture) had been built as a source of paddy fields (3.14 million ha, about 6% of the land area) mainly in rice farming, and about 70% of ponds had been built before the Edo period.

"KOTOKU-NUMA" a treasure of our town, has also undergone expansion work of refurbishment by utilizing the topography of YATSUDA (rice field at valley bottom),

Refurbishment extension work was carried out by design guidance of Nagata Hachiro Emon who was a big famous farmhouse of the Edo period (Genroku 14 years 1701), until recently it had been an important pond as agricultural water.

Now, widely known as a sight resource of Naka City Urizura, a wintering ground of the southernmost tip of the whooper swan "KOTOKU-NUMA" from 1966, becoming a spot of relaxation for citizens.

However, as the maintenance of the quality of the reservoir by KAIBORI (draining a pond) became difficult, the environments of SATOYAMA (village-vicinity mountain) and YATSUDA around the TAMEIKE have also been severely impaired. This situation is becoming the big topics of domestic reservoir.

The URIZURA-CHIKU MACHIZUKURI IINKAI (Urizura District Community Planning Committee) has been promoting activities for improving the environment of the KOTOKU-NUMA area around the SATOYAMA at 2010. This time we will report on the outcomes and issues of the residents' activities about "Kotoku-numa nature preservation association"

Keyword: Water conservation, Satoyama, Whooper swan, Tameike

Technical Session 9: Integrated Lake Basin Management (ILBM)

P9-1 DEVELOPMENT AND THINKING OF THE INTEGRATED TREATMENT SYSTEM OF BASIN WATER ENVIRONMENT

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The current water environment issue has become an important factor constraining China's socio-economic development. With the introduction of a series of major governance initiatives at the national level, the water-environment-treatment market is expanding. This paper based on the analysis of the challenges faced by China's eco-environmental policy environment and water environment governance, elaborates the importance of enterprises' participation in water environment integrated treatment and the development and future direction of water environment integrated treatment technology system. In addition, this paper analyzes the application of water environment integrated treatment technology system taking the project of integrated treatment of Shaping River water environment in Heshan City as an example.

Keyword: basin water environment, integrated management system, Shaping River

P9-2 TOWARD RAISING LOCAL RESIDENTS' AWARENESS OF LAKE KASUMIGAURA'S WATER ENVIRONMENT

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Following the formulation of a river improvement plan for Lake Kasumigaura in February 2016, over the next 20 to 30 years water environment projects are being undertaken at Lake Kasumigaura based on the plan. Civic activities were energized by the 6th World Lake Conference in 1995 and local residents became involved in various ways. As the 17th World Lake Conference to be held in October 2018 approaches, it has been remarked that public interest is waning, and it is seen as essential to foster momentum and promote cooperation in the basin area. In order to grasp awareness among local residents of Lake Kasumigaura's water environment, four kinds of questionnaires were conducted across a broad range of population segments. The results showed that the higher the level of involvement of residents in Lake Kasumigaura through interest in Lake Kasumigaura and familiarity with the lake as a place to visit and enjoy, the greater the appreciation of Lake Kasumigaura's water environment. In future, it is important to conduct PR activities in order to further promote cooperation in the Lake Kasumigaura basin area and projects that bring people into direct contact with Lake Kasumigaura, and to raise awareness among local residents.

Keyword: Ecosystem services and basin policy

P9-3 WATER QUALITY MANAGEMENT OF DAM RESERVOIRS MANAGED BY THE MINISTRY OF LAND, INFRASTRUCTURE AND TRANSPORT

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In order to improve the water quality of dam reservoirs, the Ministry of Land, Infrastructure and Transport is conducting a systematic study in close collaboration with several organizations. This paper outlines the water quality management of dam reservoirs managed by the Ministry of Land, Infrastructure and Transport, as well as the "Guidance for Improving the Water Quality of Dam Reservoirs" scheduled to be released now.

Keyword: ILLBM, water quality management

Technical Session 9: Integrated Lake Basin Management (ILBM)

P9-4 LAKE KASUMIGAURA PURIFICATION AREA ACTIVITIES

Isao Kamata

University of Tsukuba

The Tsukuba Eviro Office is committed to promoting regional natural environmental activities promoted regional strategies, harmonies coexistence with nature, conservation of ecology in urban and rural areas, measures to promote inland water fisheries, etc. Do business that Support.

Keyword: Integrated Lake basin management, Watershed activities and material cycle

P9-5 FUNCTIONING OF THE KARSTIC SYSTEM OF INFLUENCE OF THE BACALAR LAGOON APLIED TO THE TERRITORIAL ECOLOGICAL ORDERING

Silvana Marisa Ibarra Madrigal¹, Héctor Abuid Hernández Arana¹, María Amalia Gracia¹, Birgit Schmook¹, Rosa María Leal², José Arturo Gleason Espíndola³

¹Colegio de la Frontera Sur, ²Centro de Investigaciones Científicas de Yucatán, ³International Water Assesment

The Yucatan Peninsula, presents a karstic topography of biogenic origin, highly permeable, resulting in an underground hydrological system strong connected, with superficial expressions such as cenotes, lagoons and wetlands but without perennial streams. Scientific investigations prove the particularity of this type of biophysical system announcing the high vulnerability to ecological deterioration associated with the contamination and fragmentation of the structural and functional connectivity of the water flow. Given the need to use the territory, legislative elements whose mandate is the maintenance of the ecological, among them, the Territorial Ecological Ordinances (OTS), binding public policy instruments regarding the use of land, should be built in consideration of the natural vocation and mechanisms of intersectoral participation. Quintana Roo's government, since 2012, has operated the preparation of the Local Ecological Management Program of the municipality of Bacalar (POEL), showing in 2017 a version that nullifies the high permeability of the municipal surface, which leads us to investigate why the advance in the design of the POEL does not recognize the characteristics of the karstic system. It will be a qualitative research, during 2018, with combined multi-method work: semi-structured interviews, recording in field diary and actor map, participant observation, documentary analysis, generation of a conceptual base model for the determination of the natural vocation, with what is expected to identify opportunities for improvement in the intersectoral linkage given in this process.

Keyword: karstic system, hidrology, intaeractoral and intersectoral vinculation, public policy, water sensible cities

P9-6 CONSTRUCTION OF LAND USE MODEL FOR FLOOD ANALYSIS FOR LAGUNA LAKE IN THE PHILIPPINES

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Recently, floods are occurring more frequently in many areas around the world due to climate change. Especially, when large floods occur in developing countries like The Philippines, there are major concerns about economic losses as well as injuries to people and loss of life. Therefore, how to adapt to such situations in these climate-vulnerable areas is an important research topic. In The Philippines (and many other developing countries), the population and economy are expected to grow rapidly in the future, and this population growth and economic development is likely to result in significant land use changes. Furthermore, these land use changes also affect rainfall runoff rates, and the risk of flooding will be increased if many vegetated areas (e.g. forests, agroforests, or croplands) are converted to impervious (e.g. residential or industrial) areas. In this study, to understand the potential impacts of future land use changes on flooding around the Lake Laguna in the Philippines, we first construct a land use model for the year 2100 incorporating future population and demographic projections.

Keyword: Laguna lake, Flood inundation analysis, Population and household dynamics, Land use model

Technical Session 9: Integrated Lake Basin Management (ILBM)

P9-7 CLIMATE RESILIENT WATER SECURITY FOR URBAN SETTLEMENTS : ROLE OF LAKES A CASE OF BENGALURU,INDIA

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The enormous life loss, economical damages and ecological implications due to climate changes of extreme dry and flood conditions have been causing concern. The international initiatives in the form of ILEC Foundation has the necessary heritage of standard formats to document and develop sustainable conservation and management of lakes.(ILEC/UNEP, 1989). Studies using survey maps and satellite imagery have indicated that the urban growth is galloping at the cost of water bodies and lakes at Bengaluru (NNRMS, 1985). In this presentation the Landuse of Bengaluru (BDA, 2031) and the causes for degradation of water bodies in the urban region is reviewed. The efforts to manage water bodies through statutory and policy directives and their effectiveness are discussed. Community centered water bodies management an offshoot of citizen response since 1990s are documented. Necessity prevail for definite policy guidelines with socio-technical aspects of Lakes management using ILEC SENCLE model.. Best practices in lakes management and environmentally Sound Technologies (IETC, 1999) are focused.

Keyword: Lake Basin Governnace, ILBM, Ecosystem Services, Multiple uses of Lake

P9-8 CONTROL OF WATER HYACINTH IN THE LAGOON OF YURIRIA, GUANAJUATO MEXICO

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Yuriria lagoon is a freshwater body located in the city of Yuriria, Guanajuato, Mexico, cataloged as Natural Protected Area (NPA) and RAMSAR site. For decades in the lagoon has spread the growth of the aquatic plant *Eichhornia crassipes* (commonly known as water hyacinth), causing environmental, social and economic issues in the region. To continue using the hydric and biological resources of the system, integral efforts to reduce the impact area to the aquatic weed in the lagoon were made. Mechanic, manual and chemical actions were applied. The impacted area was monitored through satellite images. The impacted area with water hyacinth in June 2017 was near to 22% of the lagoon. In April 2018 the impacted area was 10 %. Efforts should continue to reduce water hyacinth present in Yuriria lagoon to acceptable levels.

Keyword: Yuriria lagoon, Waterhyacinth, Integral control

Exhibitions of Activities by Hosts

CONCEPT OF IBARAKI KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER

Ibaraki Kasumigaura Environmental Science Center, Ibaraki prefectural Government

Ibaraki Kasumigaura Environmental Science Center (IKESC) was founded in 2005, after advocacy for its establishment at the 6th World Lake Conference held in 1995 in Tsukuba and Tsuchiura. IKESC aims to effectively perform its four functions - research and technical development, environmental education, cooperation with and support for citizen's activities, and information exchange. These functions are performed through the partnership with citizens, researchers, business companies, and governments in order to tackle issues related to the conservation of lakes and rivers in Ibaraki Prefecture.

ENVIRONMENTAL EDUCATION PROJECT ETC. AT KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER

Ibaraki Kasumigaura Environmental Science Center, Ibaraki prefectural Government

At Ibaraki Kasumigaura Environmental Science Center, we provide various environmental learning opportunities so that many people can be familiar with Lake Kasumigaura, other lakes and rivers, and cultivate a mind to care for water environment. In environmental learning, we are carrying out learning on ship, and observing fish and plants, etc. so that we can feel Lake Kasumigaura and the surrounding nature familiar with us.

ON THE RESEARCH STUDY ON KASUMIGAURA AT THE KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER

Ibaraki Kasumigaura Environmental Science Center, Ibaraki prefectural Government

The Ibaraki Kasumigaura Environmental Science Center was proposed to be established at the 6th World Lake Conference held near Kasumigaura in 1995, and opened in April 2005. The center works on conservation of water environment and atmosphere of lakes and rivers in the prefecture, such as Lake Kasumigaura. We conduct research on water quality, phytoplankton, zooplankton, and weather conditions of Lake Kasumigaura to clarify factors affecting water quality variation. We are also elucidating the dynamics (generation mechanism, movement, accumulation, etc.) of water bloom with the aim of predicting occurrence. We work to clarify the pollutant load flowing from the basin of Lake Kitaura, where agriculture is popular, and the dynamics of the pollutant load flowing directly into the lake from farmland such as paddies and lotus field. Also, we verify and develop technology to reduce inflow load from agricultural land using circulation irrigation, and verify the effects of the equipment and facilities directly purifying lake and river water.

Exhibitions of Activities by Hosts

ECOSYSTEM SERVICES OF LAKE KASUMIGAURA

Ibaraki Kasumigaura Environmental Science Center, Ibaraki prefectural Government

Currently, about 960 thousand people live in the Kasumigaura basin. Agriculture and industry are popular because of the proximity of the Kashima coastal industrial zone and the wide distribution of paddy fields, lotus fields, and upland fields around Lake Kasumigaura. Many of these daily living and economic activities use water from Lake Kasumigaura. In addition, the fishery industry, such as fishing of smelt and cultivation of carp, is active in Lake Kasumigaura, and traditional aspects such as production of Tsukudani (fish boiled in soy sauce) and operation of Hobikisen (large white sail boats) are maintained and leveraged as tourist resources. Kasumigaura is surrounded by concrete embankments, and the water level is controlled by the Hitachi River Flood Gate. In addition to providing water for agriculture and industry, the flood gate adjusts to contain floodwaters during heavy rain. Thus, many people receive diverse benefits (ecosystem services) from Lake Kasumigaura. To ensure that people can continue to use Kasumigaura's ecosystem services in the future, it is necessary to understand what types of services are used and how much benefit people receive, and to link this to lake basin management.

CONSERVATION ACTIVITY OF ENDANGERED PLANTS AT SUGAO-MARSH, IBARAKI PREFECTURE, JAPAN

Ibaraki Nature Museum

Conservation activity of endangered plants is being performed at Sugao-marsh it neighbors at Ibaraki Nature Museum. Endangered plants such as *Viola raddeana* Regel is many in Sugao-marsh. An endangered plants colony in Sugao-marsh was mowed by a resident periodically locally formerly, but there was fear of a change in the environment by the vegetation transfer and a decline in endangered plants colony after the grass wasn't mowed any more. So Ibaraki Nature museum, a local group, a university and NPO, etc. cooperate and are putting grass-burning which had preservation of endangered plants for its object into effect more than 2003 years. 1039 individuals increased in that the numbers of individuals of the quality *V. raddeana* Regel were 15 individuals in the area of 16m² in 2003 with 1703 individuals in 2006 in 2004. A riverbed on Kokai river, like, fields is burned off and a community of a quality *V. raddeana* Regel and *Gagea japonica* Pascher is maintained.

ABOUT THE RAMSAR CONVENTION REGISTRATION WETLAND "HINUMA"

Ramsar Convention Register Wetland Hinuma Association

Hinuma Lake extends over the city of Hokota, Ibaraki Town and Oarai Town. In the whole Kanto area, Hinuma is the only brackish lake, which means that its waters are slightly salted. Hinuma has long been famous as a production center of clam and also known as a place where winter birds comes. Hinuma was Internationally recognized as an important wetland, because of registered as a Ramsar Treaty in 2015. Ramsar Treaty is an international treaty to protect the wetland which waterfowls uses much. Its official name is "The Convention on wetlands of International Importance". This treaty aims of using blessing wetland wisely and conserving important wetland that is rich in biodiversity. As a summary of Hinuma, it is registered on May 28, 2015, the registration number is 2232, the area is 935ha.

Exhibitions of Activities by Hosts

EFFORTS OF THE BIODIVERSITY CENTER BY IBARAKI PREFECTURAL GOVERNMENT

Biodiversity Center, Natural Environment Division, Ibaraki Prefectural Government

Basic Act on Biodiversity was established in 2008, which obliged local governments to make efforts to plan biodiversity strategies. In 2014, Ibaraki Prefecture planned Ibaraki's Biodiversity Strategy, and set up Ibaraki Biodiversity Center in April, 2015. According to Ibaraki's Biodiversity Strategy, the functions of Ibaraki Biodiversity Center were mainstreaming and public awareness of necessity of biodiversity conservation, collecting information and coordination, investigations and researches of biodiversity. The achievements of the Center during 2015-2017 are: public awareness activities; the first anniversary event of Hinuma wetland's registration under the Ramsar Convention, Mt. Tsukuba temporary visitor center, extermination events of invasive alien species, collecting information and coordination; developing creatures search system, setting up of invasive alien species extermination liaison council, investigations; northern area natural park investigation, Lake Kasumigaura creatures investigation, discussion for making Red List of non-vascular plants, fungi and algae, and measures; registration of Tsukuba clawed salamander as rare species under act on Conservation of Endangered Species of Wild Fauna and Flora, extermination of alien plants in Shintonegawa river, countermeasures for fire ants/tropical fire ants. We will make efforts continuously to conserve Ibaraki's biodiversity with understanding and cooperation of municipalities, environmental groups, residents etc.

RICH BIODIVERSITY OF LAKE KASUMIGAURA AND ITS SURROUNDING AREAS

Biodiversity Center, Natural Environment Division, Ibaraki Prefectural Government

Lake Kasumigaura was formed as a lagoon about 60 million years ago. Its area reaches 220 km², and is second largest after Lake Biwa in Japan, but, it is very shallow with an average depth of 4 m. The lake had great environmental changes, due to the improvement works on the Tone River during the Edo period, and structural changes to meet the increasing needs of lake water for industry, agriculture and drinking after the World War II. The transparency of lake water has fallen with the progress of eutrophication. The ecosystems and biodiversity in the lake and surrounding areas have been formed as a result of these environmental changes. The submerged plants, which widely flourished formerly in the lake, have almost disappeared by the end 1980's, and floating-leaved plants and vegetation along lake shore have also declined. In Ukishima and some other areas, large reed and other plant colonies have survived, providing birds and animals with good habitats. Closure of Hitachigawa water gate since 1975 has converted the lake water into real fresh water and obstructed many migratory fishes swimming upstream. But some fish species changed their life into landlocked form. Through many historical changes, the Kasumigaura areas still have precious biological resources providing a cradle for various living things, such as plants, mammals, birds especially ducks and bean geese, fishes, and many other animals. "Rivers and lakes of the Kasumigaura-Kitaura water system" were selected to be one of "important marshes in Japan", and "Kasumigaura-Ukishima, and the areas of the lower Tone River and a rice-field" were selected to be one of "500 important Satochi-Satoyama in Japan" by the Ministry of the Environment.

"A LOW-PROTEIN DIET SUPPLEMENTED WITH SYNTHETIC AMINO ACIDS"MAKES ANIMAL INDUSTRY ENVIRONMENT-FRIENDLY

Ibaraki Prefectural Livestock Research Center

Kasumigaura Watershed is the area where the livestock industry is prosperous and we work on a study of eco-friendly livestock industry with low nitrogen discharge for the water purification of Kasumigaura in Ibaraki. As the consistency, we performed a study about "a low-protein diet supplemented with synthetic amino acids" of the low protein diets, which regulated feed amino acid contents in cooperation with the National Agriculture and Food Research Organization (Institute of Livestock and Grassland Science) , at the Ibaraki Prefectural Livestock Research Center. As the result, we confirmed that we reduced approximately 60% of urine excretion quantity approximately 30% of urinary nitrogen excretion without affecting the productivity on Fattening Pigs. In addition, we confirmed what could largely reduce ammonia and greenhouse gas (nitrous oxide) which were generated when we worked to purify filthy water. On the other hand, we also worked on the development of new feed using local resources such as tofu cake and forage rice. We confirmed that this feed had the effect of reducing the amount of ammonia generated during composting process. Furthermore, we are developing the environment-friendly diets in Poultry.

Exhibitions of Activities by Hosts

LIVESTOCK AND EFFORTS TO IMPROVE WATER QUALITY IN KASUMIGAURA WATERSHED

Livestock division, Ibaraki prefectural Government

It is feeding nearly half of the livestock of the whole prefecture in the Kasumigaura watershed, and the business scale of livestock has been expanding year by year. Compost produced by livestock farmers is used in themselves and farm crop producers, but in some areas it is excessive and it is difficult to use it only within the area. Therefore, Ibaraki prefectural Government has established "Plan for promotion of utilization of livestock manure" in order to promote the use of livestock manure in the prefecture and "7th Plan for conservation of lake water quality" and support for development of livestock manure treatment facilities etc, wide-area distribution of high quality compost, and fuel use of livestock manure. From now on, we will further promote the reduction of livestock manure, etc. in addition to these, in order to reduce pollutant load from livestock industry.

EFFORTS TO REDUCE ENVIRONMENTAL IMPACT IN LAKE KASUMIGAURA BY THE IBARAKI AGRICULTURAL CENTER

Ibaraki agricultural center, Ibaraki prefectural Government

Ibaraki Agricultural Center has established a project; "Development of Environmentally Friendly Agriculture Technology" as a priority research project aimed at developing a fertilizer application program that promotes reduced amount/rate of nitrogen runoff. The project is particularly tasked on conducting research concentrating on the effective utilization of Lotus root (*Nelumbo nucifera Gaertn.*) a major cash/food crop produced around Lake Kasumigaura and Japan; Upland fields producing a variety of vegetables and Livestock biomass exploiting the water resources around the lake.

The research subjects of the project are clustered into three sub-research projects: 1) Lotus root; aimed at reducing nitrogen runoff by way of developing a fertilization method boosting reduced fertilizer usage and development of a simple diagnostic technique in determining ground nitrogen accumulation in and around the lake. 2) Upland field: reduction in the amount of fertilizer runoff by means of employing appropriate fertilization based on soil diagnosis and development of local fertilization technology. 3) Livestock biomass: reduce the environmental burden impacted by fertilizers containing phosphorus and ammonia within the basin of the lake by way of augmentation with livestock biomass in the fields around the vicinity of the lake; a mixture concept of livestock biomass and fertilizers promoting reduced fertilizer runoff negative impacts.

EFFORTS TO REDUCE ENVIRONMENTAL BURDEN IN AGRICULTURE IN KASUMIGAURA BASIN

Agricultural Technology Division, Ibaraki Prefectural Government

The Kasumigaura Basin is shaping to be a production area due to many factors such as the presence of rice and lotus roots fields in the lowlands of the lakeshore, the Asian pears and chestnuts of the Niihari plateau and the cultivation of various vegetable produce like the sweet potato of Namegata. While interest in environmental issues is increasing with a need for the promotion of the corresponding agriculture, there is a demand for cultivation technology that will decrease the burdens on the environment present in the production areas mentioned above. Thus, in order to preserve the water quality of Kasumigaura through the creation and propagation of environmental burden decreasing cultivation technologies, we are putting our efforts in the "Efforts to Reduce the Environmental Burden of Agriculture in Kasumigaura Basin" project. In an effort to implement cultivation that reduces the burden of maintaining a good quality of water in Kasumigaura, the development and the spreading of new soil diagnosing fertilizer and suitable fertilizer as well as the demonstration of fertilizer reduced cultivation of lotus root fields in the surrounding areas of Kasumigaura are currently in the works.

Fertilizer reduced cultivation techniques are continuing to be implemented in lotus roots fields and their yields will be examined. The water flowing from these fields will also be examined for its quality in order to evaluate the effectiveness of this type of cultivation. The establishment of fertilizers that proves effective for lotus root fields and reduces the burden on the environment, will bring about the development of diagnosis fertilization technology.

Also, the establishment of test sites for the demonstration of suitable nitrogen fertilizers that reduces compost and chemical fertilizers as well the development and spreading of said fertilizer are in progress.

Exhibitions of Activities by Hosts

ABOUT NEW ADVANCED WATER TREATMENT TECHNOLOGY

Public Enterprise Bureau, Ibaraki prefectural Government

In the Ibaraki Prefectural Government Public Enterprise Bureau, water treatment disorders (coagulation inhibition, filter trouble, musty odor substance occurrence) caused by massive generation of algae and trihalomethane concentration due to the solubility substance in summer we have various treatment issue such as rising. And due to the revision of water quality of Lake Kasumigaura, the purification treatment cost for removing dirt and moldy substances dissolved in water has been increasing year by year, so it is urgent an efficient and stable water purification treatment method it was.

For this reason, we jointly conducted research with private enterprises at a water purification plant with Lake Kasumigaura as it's water source, and selected two method, magnetizable ion exchange resin treatment and advanced oxidation treatment using ozone and hydrogen peroxide + bioactive carbon treatment, we have carried out demonstration experiments for practical use since December 2014.

ADVANCED WASTEWATER TREATMENT OF KASUMIGAURA SEWAGE TREATMENT CENTER

Regional Sewerage Office, Ibaraki prefectural Government

The Lake Kasumigaura, located in the southeast region of Ibaraki Prefecture with the second largest lake area in Japan of 220km² after Lake Biwa, serves as an important water resource in the Metropolitan area. Although the Lake Kasumigaura used to be so transparent that the bottom of the lake could be seen, water pollution due to eutrophication rapidly deteriorated with the increase of population in the catchment area and development of socioeconomic activities since 1970s. The Lake Kasumigaura has not been continuously met the environmental quality standards for COD, nitrogen and phosphorus. The causes are so diverse as domestic wastewater, effluent from factories and business place, effluent from livestock farms, effluent from farmland and urban areas, and elution from sediment of the bottom of the lake.

In order to cope with the situation, various countermeasures have been comprehensively implemented with "Plan for Conservation of Lake Water Quality Concerning Lake Kasumigaura" established. Among others, what is especially important as a measure against the domestic wastewater is the improvement of the sewerage system.

Ibaraki Prefecture is pushing forward with the improvement of the four regional sewerage in the Kasumigaura catchment basin. One of them, the Kasumigaura Kohoku Regional Sewerage was launched in fiscal 1973 and placed in service in January 1979 with the aim of preventing water pollution of the Lake Kasumigaura and improving the living environments in five municipalities including Tsuchiura City and Ishioka City.

HIGH EFFICIENCY ON-SITE MEASUREMENT SYSTEM FOR HEAVY METALS VIA COMBINATION OF HOMOGENEOUS LIQUID-LIQUID EXTRACTION (HOLLE) AND SMART DEVICE

Industrial Technology Innovation Center Of Ibaraki Prefecture of Government

It is essential to grasp heavy metals concentration for environmental protection. These should be controlled by instrumental analysis such as ICP-AES. Although visual colorimetric analysis is used for on-site measurement, concentration identification includes a problem because a color is light in low concentration. Considering these circumstances, concentration and analysis were paid attention to in this study. Proposed system consists of homogeneous liquid-liquid extraction (HOLLE) and smart device. HOLLE could separate and concentrate heavy metals effectively with only addition of reagents in several minutes. Smart device such as smartphone could easily detect color change on camera segment in several seconds. Heavy metals complex having color was examined in order to perform colorimetric analysis. Heavy metals complex such as Pb(II)-dithizone and Cd(II)-TAN(1-(2-thiazolylazo)-2-naphthol) complex were satisfactorily extracted by HOLLE under water-water soluble organic solvent-dimethyl phthalate ternary solvent system. After phase separation with Cd(II)-TAN, the volume ratio [aqueous phase (Va) / water-immiscible liquid phase (Vo)] was 120 (28.9 mL → 0.240 mL). On the basis of bright colored water-immiscible liquid phase, smart device could easily detect heavy metals in ppb level. This knowledge is expected to lead to the development of new concentration and analysis technologies for on-site measurement.

Exhibitions of Activities by Hosts

MARINE PRODUCT PROCESSING IN LAKE KASUMIGAURA, LAKE KITaura AND OTHER LAKES

Kasumigaura and Kitaura Fishery Office, Ibaraki Prefectural Government

Lake Kasumigaura and Lake Kitaura are home to many types of fish and shellfish such as pond smelt, Japanese icefish and river prawns. These fish are used in processed products such as preserved fish boiled in soy sauce or dried fish and have been popular as local speciality products since long ago.

A wide variety of fishing methods are used including trawl fishing, set-net fishing and gill net fishing. Furthermore, net cages in the lakes allow for the cultivation of fish such as carp.

In this way, the rich resources of Lake Kasumigaura and Lake Kitaura contribute greatly to our marine product industry.

MEASURES FOR THE CONSERVATION OF MARINE RESOURCES AND FISHING GROUND IMPROVEMENT IN LAKE KASUMIGAURA AND LAKE KITaura

Kasumigaura and Kitaura Fishery Office, Ibaraki Prefectural Government

The fishing industry not only provides fish and shellfish as food products but also contributes to improving water quality in the lakes through removing the nitrogen and phosphorus contained within fish. Through conserving marine resources and improving fishing grounds, we are working towards maintaining the benefits of the lakes for the future.

THE SAILBOAT AND SAILBOAT NET FISHING OF KASUMIGAURA

Culture Division, Prefectural Education Agency, Ibaraki Prefectural Government

Sailboat net fishing, is a unique method of fishing that utilizes wind to capture fish. The sailboat is specifically placed such that wind hits it from the side and slides along with a submerged net, capturing fish in the process. Devised during the Meiji time period, this method of fishing has become widely used in Kasumigaura and Kitaura. Though sailboats were eliminated after the lifting of the ban of the Trawling method of fishing in 1967, sailboats are making a comeback as touristic attractions.

In sailboat net fishing, while using the reins that raise and lower the sail to adjust for the wind impact, the net is spread in a three-dimensional fashion and pulled back by ropes attached to the bow and stern of the boat. In order to ensure the stability of the sailboat and the correct conduct of the technique, keeping the balance between the strength of the wind incurred by the sail, the water pressure incurred by the net and the weight of the ship is necessary. The sailboat net fishing method calls for the balance of the ship and the net while employing a technology that skillfully operates various ropes. Because of these characteristics, this fishing technique was selected to be part of the [Selected Intangible Folk Cultural Property] in 2018.

Exhibitions of Activities by Hosts

INTRODUCTION OF TSUKUBA-KASUMIGAURA RING-RING ROAD

Regional Development division, Ibaraki prefectural Government

"Tsukuba-Kasumigaura Ring Ring Road" is a cycling course with a total length of 180 km combined with a bicycle trail using the tracks that were used for Tsukuba Railway discontinued years ago and a lake coast road around Lake Kasumigaura. Moreover, "Tsukuba-Kasumigaura Ring Ring Road" have various regional resources such as ① close to Tokyo, ② rich nature and landscapes such as Lake Kasumigaura and Mt. Tsukuba, historical and cultural assets represented by Kashima Shrine, ③ flat and easy to ride, it is a cycling course that you can enjoy from beginners and families to advanced people!

In Ibaraki prefecture and the municipalities around "Tsukuba-Kasumigaura Ring Ring Road", we aim to form the best cycling area in Japan that allows everyone to enjoy cycling diversely while linking various regional resources and utilizing the excellent accessibility from the Tokyo area.

IBARAKI TOURISM

Tourism and Local Products Promotion Division, Ibaraki prefectural Government

To the east of the Kanto region with about one-hour train ride from Tokyo, the capital of Japan, Ibaraki Prefecture is blessed with breathtaking natural beauty in spite of such a convenient location. For example, the 190-km-long coastline is spectacular, Mt. Tsukuba is rich in precious plant species, Fukuroda Falls is counted in the three greatest waterfalls and Lake Kasumigaura is the second largest lake in Japan: each of them provides an enchanting view.

Ibaraki's tourist attractions are countless. First, Kairakuen Garden, one of the three famous gardens in Japan, is well known and designated as a Japan Heritage. Second, historic facilities including the Kashima Jingu Grand Shrine, which is the head of 600 Kashima Jinja Shinto shrines nationwide, are recommended. In addition, Ryujin Big Suspension Bridge is popular with bungee jumping fans because jumping a 100 meter gap from the bridge is the highest one in Japan. Lastly, the amazingly beautiful blue scene created by the nemophila flowers, or baby blue eyes, in Hitachi Seaside Park attracts lots of tourists from all over the world.

Ibaraki produces various kinds of things. Regarding traditional craftworks, the Yuki Tsumugi silk fabric is authentic Japanese all-by-hand woven silk, the Kasama-yaki pottery features each artist's originality, and the Makabe Ishidoro stone lanterns are well known for applying delicate elegant carvings onto the stone. Ibaraki is also a treasury of food full of the blessings of nature. As a specialty from autumn to winter, why don't you try Hitachi Akisoba buckwheat noodles made using fresh local buckwheat flour, and Anko (anglerfish) dishes including Anko-nabe, a hot pot cooked at the table? Naturally, other food of the season can be relished throughout the year.

WATER QUALITY IN LAKE KASUMIGAURA

Environmental management division, Ibaraki prefectural Government

Lake Kasumigaura is the second largest lake in Japan and a million people lives in the watershed. Water quality has been measured at 8 points in the lake and 24 inflowing rivers. COD in the lake has two peaks in 1979 and 2009, and it is same level after that. TN has remained flat over the long term, but has been changing in recent years. TP has been upward trend over the long term, but it has remained flat in recent years.

Exhibitions of Activities by Hosts

7TH PLAN FOR CONSERVATION OF LAKE WATER QUALITY

Environmental management division, Ibaraki prefectural Government

Lake Kasumigaura (Lake Nishiura, Kitaura, Hitachinonegawa), the second largest lake in Japan, is an important water resource in the metropolitan area, as well as in Ibaraki Prefecture. It is a priceless valuable asset to nurture rich water quality resources. Ibaraki Prefecture has been pursuing efforts for water quality purification based on the Lake Water Quality Conservation plan for 6th 30 years. We formulated a Lake Water Quality Conservation plan (seventh term) concerning Lake Kasumigaura in March 2017, and reduce the cause of pollution of Lake Kasumigaura (pollution load) more than before.

FOREST LAKE ENVIRONMENT TAX WORK

Environmental management division, Ibaraki prefectural Government

Ibaraki Prefecture is blessed with a wide variety of rich natural environments such as "Forest that exists as a core in the northern part of the prefecture" and "Lakes and rivers such as Lake Kasumigaura that supplies water for drinking water, agricultural water, industrial water".

Those forests, lakes and rivers have a variety of public benefit functions such as a function to prevent global warming such as absorption of carbon dioxide, a water source training that accumulates rainwater to cultivate clean water, and a health rest as a place for leisure activities.

However, in recent years forestry insufficiently managed due to deterioration of forestry profitability etc. is increasing, and its devastation has progressed, and deterioration of public interest functions such as water source cultivation and prevention of sediment discharge.

Although the amount of pollutant load that flows into Lake Kasumigaura etc. has been reduced due to efforts to purify water quality, the quality of water in the lake has remained flat and has not reached significant improvement, resulting in problems such as the generation of offensive odor due to the growth of algae with nitrogen or phosphorus as a nutrient source and the deterioration of the landscape were caused.

In Ibaraki Prefecture, opinions of the prefectural people collected by public comment and while considering the situation of other prefectures established forest lake environment tax ordinance in December 2007, started taxation of forest lake environment tax from April 2008.

EFFORTS TO IMPROVE WATER QUALITY IN LAKE HINUMA BY THE IBARAKI PREFECTURAL GOVERNMENT

Environmental management division, Ibaraki prefectural Government

Lake Hinuma is the only brackish water lake in the Kanto region. From the upstream, the Lake Hinuma flows into the rivers such as the Hinuma River and the Kansei River. At the time of high tide, sea water moves upstream from Naka River downstream. The area of Lake Hinuma is 9.35 km², the third largest lake in Ibaraki Prefecture next to Lake Kasumigaura (Nishiura), Kitaura. The watershed extends to 3 cities and 3 towns, Mito, Kasama, Hokota, Ibaraki, Oarai, Shirosato. In addition, it is a fishing ground such as 'Yamato Shizimi' (*Corbicula japonica*), many water birds and migratory birds are also found, and it is also a habitat for rare fauna and flora such as 'Hinuma Itotombo' (*Mortonagrion hirosei*). Landscape and lakeshore scenic spots are widely used by people inside and outside the Ibaraki as a place for relaxation. In May 2015, Lake Hinuma was registered as an internationally important wetland in the Ramsar Convention. Further activities are required for purification of water quality, preservation of the natural environment and wise use in the future. In 2000 the Hinuma Lake Water Quality Conservation plan was established that sets water quality targets and comprehensive water quality conservation measures, in order to conserve the water quality of this valuable Hinuma lake, maintain fishery resources, preserve the habitat and growth area of various kinds of organisms, and to succeed to the next generation.

Since then, review the plan every five years, is currently being promoted Water Quality Conservation Plan in the fourth period.

Exhibitions of Activities by Hosts

WATER QUALITY AND WATER QUALITY CONSERVATION MEASURES OF LAKE USHIKUNUMA

Environmental management division, Ibaraki prefectural Government

Lake Ushikunuma is the third largest lake in Ibaraki and about 130,000 people lives Lake Ushikunuma watershed. Moreover, population increase is expected in the Lake Ushikunuma basin due to the development of area along Tsukuba Express Line.

In Ibaraki prefecture, we have devised the Lake Ushikunuma Water quality Conservation plan for 15years. To reduce inflowing pollutional load, we have been promoting Household Wastewater Management, Livestock Waste Management, plane source measures, etc. based on the plan.

In March 2018, we decided to newly devise "the 4th term Lake Ushikunuma Water quality Conservation plan " and continue to improve the quality of Lake Ushikunuma water quality. As a result of these efforts, despite the increasing catchment population in Lake Ushikunuma , COD shows a decreasing trend.

EFFORTS FOR PURIFICATION OF WATER QUARITY IN LAKE KASUMIGAURA BY THE COUNCIL FOR CONSERVATION OF LAKE KASUMIGAURA

The Council for conservation of Lake Kasumigaura

The predecessor of our Council "The Society to Resolve Pollution Problem of Lake Kasumigaura" was established by mayors (cities, towns and village) of Kasumigaura watershed in 1973 after fat formation of Aoko (blue-green algae) and collapsed death of farmed carp in the Lake as well. Later the Council was renamed "The Council for conservation of Lake Kasumigaura". Currently the Council is formed with members of almost all 21-municipality mayors of the watershed. In order to improve welfare in the watershed, we have been implementing projects related to environmental conservation of Kasumigaura and inflowing rivers. The main five projects are shown below. The Lake is a precious property that brings us a lot of benefits. It is a resource used not only as tap water, but as water of agriculture, industries and so on, as well as wide range of fields including fisheries, marine sports and so on. Our council will make a steady and persistent effort for environmental conservation of the lake and the rivers toward many sustainable ecosystem services.

RESEARCH AND DEVELOPMENT FOR SUSTAINABLE AGRICULTURAL PRODUCTION - CONSERVATION OF WATERSHED ENVIRONMENT AND ECOSYSTEM SERVICES

National Agriculture and Food Research Organization (NARO)

The National Agriculture and Food Research Organization (NARO) is the core institute in Japan for conducting research and development on agriculture and food. Our overall mission is to contribute to the development of society through innovations in agriculture and food, by promoting pioneering and fundamental R&D. NARO will contribute to the sustainable development of local communities and societies in Japan by providing a stable supply of safe food, enhancing industrial competitiveness, environmental preservation, and creating new value.

In addressing agricultural environmental problems, we are focusing on research and development for addressing environmental changes such as global warming, utilization of regional resources that make the most of the multiple functions of agriculture and rural areas, and establishment of an environmental preservation-oriented agricultural system that reduces the environmental impact of agriculture. In particular, as part of our efforts to conserve the aquatic environment and ecosystem services, we are pursuing studies on the actual condition of intrusions of alien species and efficient countermeasures, evaluation and maintenance of biodiversity, dynamics and management of fertilizer components in watersheds, agricultural chemical risk assessment, and livestock wastewater treatment technology, thereby contributing to the realization of environmentally-friendly and sustainable agricultural production.

Exhibitions of Activities by Hosts

LONG-TERM MONITORING OF LAKE KASUMIGAURA, JAPAN – A 42 YEAR LEGACY AND LOOKING TO THE FUTURE –

National Institute for Environmental Studies

In 1976, National Institute for Environmental Studies (NIES) initiated a monitoring project in Lake Kasumigaura, which is located near Tsukuba city and is the second largest lake in Japan. The aim of the project was to comprehensively study water pollution and eutrophication in Lake Kasumigaura.

In 1996, Lake Kasumigaura was designated as a trend station in the GEMS/Water* Project, run by the United Nations. Furthermore, Lake Kasumigaura is registered as a core site in JaLTER**. Currently, we carry out two different types of regular investigation: monthly comprehensive monitoring at 10 sites and bimonthly fish monitoring at 1 site. We are pleased to announce that our project has been continued for 40 years. All accumulated data has been provided on the website. We have plans to further expand the database in the future.

TOWARDS CONSERVATION AND RESTORATION OF LAKE BIWA'S WATER ENVIRONMENT AND ECOSYSTEM: FOUNDATION AND PROSPECTS OF LAKE BIWA BRANCH OFFICE

Lake Biwa Branch Office , National Institute for Environmental Studies

Based on the Government Agencies Transfer Basic Policy, NIES (National Institute for Environmental Studies) Lake Biwa Branch Office opened in April 2017 within the building housing the (Shiga Prefecture) Lake Biwa Environmental Research Institute (LBERI). Both the NIES and LBERI have been conducting various studies on lake environment: the former in many lakes in Japan, such as Lakes Kasumigaura and Mashu, the latter intensively in Lake Biwa, the largest lake in Japan. To accelerate lake environment studies in Japan, NIES Lake Biwa Branch Office and LBERI started the following two joint studies: one is on the water quality and bottom environment for conservation of healthy water environment, and the other is on the evaluation, management and restoration of lake ecosystems.

RESEARCH OVERVIEWS OF TECHNIQUES OF WATER ENVIRONMENTAL MANAGEMENT CONSIDERING BIODIVERSITY AND WATER QUALITY -APPROACHES TO CONSERVATION PLANNING FOR COMPATIBILITY BETWEEN CONSERVATION OF IMPORTANT SPECIES OF AQUATIC VEGETATION AND CONTROL OF INVASIVE SPECIES

River Restoration Team, Water Environment Research Group, Public Works Research Institute (PWRI)

Lake Kasumigaura is the second largest lake with approximately one million people living in the lake basin. The Tone River, including the lake, are often affected by floods. In response, river managers have implemented flood management and control projects while developing water resources to meet the demand for water in the Tokyo metropolitan area. These developments have also succeeded in stabilizing the harvests near the lake.

Populations of important aquatic plants in Lake Kasumigaura have decreased as a result of the flood control projects and development of water resources. The managers have been able to conserve and restore the plants along the shoreline but have done so with difficulty because of the lake's large size. Also, the waves of the lake are damaging to the plants along some of the shoreline. Areas that are the most in need of conservation and restoration should be selected.

PWRI has found the mouths of tributaries that flow into the lake to be possibly suitable areas for aquatic plants and is considering planning methods for conservation and restoration.

Exhibitions of Activities by Hosts

DEVELOPMENT OF WATER ENVIRONMENT MANAGEMENT AND CONTROL TECHNIQUES FOR BIODIVERSITY AND WATER QUALITY IN LAKES - ASSESSMENT AND MONITORING METHODS FOR CONSERVATION IN BASIN WATER ENVIRONMENT -

River Restoration Team, Water Environment Research Group, Public Works Research Institute (PWRI)

Water environment research group conducts research to understand the mechanism of ecosystem and its anthropogenicity, targeting the rivers and lakes including dam reservoirs that receive a variety of impact due to human activities. The research group also conducts research on the river management techniques which are for both flood control and the environment, monitoring of pollutants and measures and approach. The Water Quality Research Team engaged in the development of methods for analyzing and monitoring chemical substances in rivers, lakes, dam reservoirs, and sewage effluent in order to reduce regional water quality risk. The team is also developing methods for understanding the behavior of contaminants and for evaluating and mitigating the impact on aquatic ecosystems.

HYDROLOGIC CYCLE AND WATER BALANCE OF LAKE KASUMIGAURA

Faculty of Life and Environmental Sciences, Research Unit on Hydrologic Science, University of Tsukuba Tsukuba, Ibaraki Japan

It is important not only scientifically but also for many practical purposes such as water quality improvement, restoration of ecosystem, or water resources management to understand hydrological processes and water balance of Lake Kasumigaura. Although it is a demanding job to determine all the fluxes of inputs and outputs, we at University of Tsukuba, have worked to estimate them based on own measurements and data obtained by the government as well as prefecture. It has been found that the annual precipitation is some 1250-1600 mm while evaporation loss from the lake is 860-950 mm. Water balance estimates also indicate that inputs to the lake consist of precipitation (about 15%), river discharge (about 75 %), discharge from agricultural fields (<10%), and rest by the discharge from domestic water treatment and groundwater flow; outputs are river discharge (60-70%), evaporation (approximately 10%), agricultural water intakes (about 15%), and the rest is from industrial water and domestic water intakes. However, improvements to the accuracy to each estimate are still needed as some of them are based on certain assumptions and insufficient data.

IBARAKI UNIVERSITY - EDUCATIONAL AND RESEARCH ACTIVITIES RELATED TO THE WATER ENVIRONMENT

Ibaraki University

Ibaraki University is a national university with 5 colleges; Colleges of Humanities and Social Sciences, Education, Science, Engineering, and Agriculture. There are also 4 graduate schools. Our goal is to contribute to building a sustainable society through unique challenges of research and education. Located in Ibaraki prefecture, which is blessed with a rich water environment such as lakes Kasumigaura and Hinuma, Ibaraki University has been promoting research and education on lakes since the time of the foundation, including "Hinuma Hydrobiological Station" established in 1956. Currently, we have "Center for Water Environment Studies" located on the lakeside of Kitaura, a part of the Kasumigaura lake system. This center is designated by Ministry of Education, Culture, Sports, Science and Technology (MEXT) as the only national hub for collaborative education on lake environment, and accepts many students for practical training from other universities.

We will further develop educational and research activities on ecosystem services from a broad perspective. We also plan to strengthen practical training and exchange programs for foreign students by cooperation with overseas universities. Through these activities, we will contribute to the conservation and wise use of water environment, and share our experiences with the world.

Exhibitions of Activities by Hosts

RADIOACTIVE MATERIAL MONITORING SURVEYS OF THE WATER ENVIRONMENT IN THE KASUMIGAURA WATERSHED

Environmental management division, Ibaraki prefectural Government

Ministry of the Environment Government of Japan and Ibaraki Prefectural Government has measured water and soil samples around the lake Kasumigaura to ascertain the detailed distribution of radioactive substances discharged by the accident at Fukushima Dai-ichi NPP as of June 2011, and the results are extremely useful for monitoring the future influences of radioactive substances. The measurement results show that the distribution of radiation levels river and lake sediments has almost been made clear through surveys (water samples were not detectable at any location).

RESULTS OF RADIOACTIVE MATERIALS (Cs-134 AND Cs-137) TESTING OF AGRICULTURAL, FORESTRY AND FISHERY PRODUCTS IN IBARAKI

Agricultural Technology Division, Ibaraki Prefectural Government

In response to the accident of Fukushima Dai-ichi Nuclear Power Plant, Ibaraki Prefecture have set up inspection plans (hereafter referred to as Prefectural Plan), and has been conducting tests on radioactive materials (Cs-137 and Cs-134) of agricultural, forestry and fishery products based on the national government's policy "Guidelines of Lifting Restrictions on Concerned Items and Areas" (Hereafter referred to as Guidelines). From 2011 to August 8, 2018, 332 items, 212,466 specimens of agricultural, forestry and fishery products have been examined for radioactive materials. In recent years, other than a small number of items, the majority of the items are detected as not containing any radioactive cesium. All results are published on the prefecture's homepage as monitoring updates, and announced on NHK Data Broadcasting (Every Saturday) and Ibaraki Shimbun (every Friday). We strive to provide the most reliable information on the safety of Ibaraki's agricultural, forestry and fishery products to all consumers.

FOR ENVIRONMENTAL RADIATION MONITORING IN IBARAKI PREFECTURE

Environmental Radiation Monitoring Center, Ibaraki Prefectural Government

In Ibaraki Prefecture one commercial nuclear reactor and any research reactor, test reactors nuclear reactors reprocessing facilities, fuel factories and related laboratories are located. The prefecture conducts environmental radiation monitoring to investigate the effects of radiation from these facilities.

In April 1957, Ibaraki Prefecture started monitoring environmental radiation with the criticality of JRR-1 of the Japan Atomic Energy Agency (formerly Japan Atomic Energy Research Institute). In 1971, we requested the government to establish a third party surveillance organization, and established the Ibaraki Prefecture Tokai Region Environmental Radiation Monitoring Committee (hereinafter referred to as the monitoring committee) ahead of the whole country. The monitoring committee clarified the division of roles of the national government, prefectural government and business operators, and formulated a monitoring plan. After that, we revised the country's environmental radiation monitoring guidelines and accidents etc. at the business establishment, and established the monitoring system of today. The monitoring committee evaluates the dose etc. of the surrounding public based on the monitoring result implemented in the monitoring plan and publishes the evaluation result through the website etc.

Exhibitions of Activities by Hosts

SAVE WATER, SAVE LAKES OF THE WORLD: PROMOTING SUSTAINABLE MANAGEMENT OF LAKES AND THEIR BASINS

The International Lake Environment Committee Foundation (ILEC)

Only slightly less than one percent of all the water resources on earth is the freshwater that is readily available for human use, with approximately ninety percent of this portion belonging to lakes and their basins. Thus, lakes are a vital water resource, constituting a rich and essential component of nature as well as providing a variety of benefits to human beings. In other words, deterioration of lake environment can heavily affect water resources. Unfortunately, however, many lakes and other inland waters around the world are in a critical condition. To address such issues, the International Lake Environment Committee Foundation, known as ILEC, in collaboration with its partner organizations around the world, promotes rational and sound management of world lakes and their catchment areas under the vision of "Save Water, Save Lakes." ILEC is a public interest incorporated foundation authorized by the cabinet of Japan and headquartered on the shore of Lake Biwa, the largest lake in Japan. Since its establishment back in 1986, the activities of ILEC have been centred around three pillars; 1) global promotion of lake basin management, most notably being carried out through the dissemination of the concept of the Integrated Lake Basin Management 2) capacity building for lake professionals and the youth through training and educational programs, and 3) successful organization of a biannual international conference on lakes, so-called the World Lake Conference. It also has an advisory panel called Scientific Committee, a group of lake professionals stationed in each continent of the world.

ENVIRONMENTAL CONSERVATION EFFORTS IN LAKES BY THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM

Ministry of Land Infrastructure, Transport and Tourism

As economic and social structures have changed greatly in the latter half of the 20th century, various harmful effects have occurred such as decreasing river flow and worsening water quality. The Ministry has been working for a sound water cycle via such things as the promotion of water circulation measures, river environment improvement and sewage improvement. In recent years, rivers, lakes and marshes have become important as habitats and environments for the reproduction and growth of living things, and we are also working for the conservation of ecosystems.

WATER ENVIRONMENTAL IMPROVEMENT IN LAKE KASUMIGAURA

Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transportation and Tourism

The water environment of Lake Kasumigaura brings diverse benefits to us. In the Kasumigaura basin, flood damage and salt damage frequently occurred in the past. As a result, the flood control plant has been raising the safety and security of the area, making it possible to use water stably in the Tokyo metropolitan areas by the water utilization project. While urbanization of river basins and development of social infrastructure have been progressing, problems of water environment such as water pollution, loss of lake shore vegetation zone and loss of lake water bathing spots have become apparent. In order to respond to these issues, the Kasumigaura River Office will continue to provide diverse benefits of the environment of Lake Kasumigaura water based on the "Lake Kasumigaura River Development Project" and "Lake Water Quality Conservation Plan for Lake Kasumigaura (Seventh Phase)". In order to sustainably enjoy and take the benefits over to the children of the future, the people in the basin are unitedly taking efforts to improve water quality, conserve and restore the natural environment, maintain good mutual relation between the river and the people, preserve and form landscape, promote environmental education and carry out basin- wide comprehensive river management.

Exhibitions of Activities by Hosts

KASUMIGAURA WATER CONVEYANCE PROJECT

Kasumigaura Conveyance Works Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transportation and Tourism

The Naka River, Lake Kasumigaura, and the Tone River have played important roles in the stable and broad-based supply of water resources, contributing to development of industry and economy in the drainage basin. However, expansion of industry and advancement of urbanization have caused various problems such as water pollution of Lake Kasumigaura and the Sakura River that runs through Mito City and drought in the Naka and Tone Rivers. In response, measures are under way to purify water and secure stable water resources in the entire drainage basin. The Kasumigaura Water-Conveyance Project is aimed at remedying these problems by forming a Kanto-Region water network that connects the Naka River, Lake Kasumigaura, and the Tone River and thus making effective use of limited water resources.

EFFORTS IN THE KASUMIGAURA DEVELOPMENT PROJECT (MANAGEMENT)

Tone River Downstream Integrated Operation and Maintenance Office Water Agency

Lake Kasumigaura is located in the southeastern part of Ibaraki prefecture. It is the second largest freshwater lake in Japan. Since it was originally an inlet of the Pacific Ocean surrounded by low-lying area. So that floods and salt damages occurred in the past, and then along with the rapid economic growth, demand of domestic, industrial, and agricultural water increased. To cope with that, Japan Water Agency (JWA) worked on the Kasumigaura development project for the purpose of flood control and new water use, and JWA has been conducting inspection and maintenance work of the lake banks, and managing the sluice gates and observation instruments since April 1996. Also, in order to preserve the natural environment of the area, known as "Myogi no hana" which occupies large part of the marchland of Lake Kasumigaura, JWA conduct environmental surveys, and carry out maintenance work of the facilities in which people can come into contact with nature. As the lake shore vegetation zone shrinks, JWA strive to restore it by creating the foreshore, making efficient use of the by-product of dredging work. Besides, considering the river environment, at the Tone river estuary barrage on Tone River, JWA makes salinity adjustment to the extent of not causing problem to water supply, in addition, fishways were installed in this project.

'BOTTOM-LAYER DISSOLVED-OXYGEN' AND 'SHORE TRANSPARENCY': NEW INDICATORS FOR JAPAN LAKES AND RESERVOIRS - TO REALIZE BETTER ENVIRONMENTAL WATER-QUALITY AND INTRODUCE INDICATORS THAT THE PUBLIC CAN READILY UNDERSTAND -

Water Environmental division, Environment Management Bureau, Ministry of the Environment

Even though, environmental loading from inflow to enclosed water bodies has been decreasing based on the lake plans, the achievement ratio of environmental water-quality standards of lakes have generally tended to flatten out at about 50%. Problems remain, such as poor oxygen water mass in bottom-layer, overgrowth of aquatic plants, decrease in native aquatic life. We are pointed out the difficulty in conveying the current situation of water environment only using the achievement ratio of past environmental water-quality standards.

In 2016 March, Ministry of the Environment implemented new water environmental indicators, 'Bottom-layer dissolved-oxygen' and 'Shore transparency', in order to improve the situation and make environmental water-quality indicators and targets that the public can readily understand.

Bottom-layer dissolved-oxygen was set as living environmental standard in terms of securing dissolved-oxygen for inhabiting aquatic life, and shore transparency was set as a regional environmental objective in terms of recreational use and conservation of aquatic plants.

Ministry of the Environment will continue approaches to penetrate measures utilizing new indicators and to achieve favorable water environment in various lakes.

Exhibitions of Activities by Hosts

EFFORTS TO CONSERVE BIODIVERSITY IN AGRICULTURE, FORESTRY AND FISHERIES

Environment policy office, Policy planning division, Ministry of Agriculture, Forestry and Fisheries

In our country blessed with rich forests and water resources, diverse agriculture, forestry and fisheries as well as extensive local biodiversity have developed in each area, adapting to the local climate and characteristics. Benefits which we receive through biodiversity (Ecosystem services) are not confined to agriculture, forestry and fisheries products. Benefits such as stable climate, clean water, pollination, soil formation and nutrient cycling can stabilize agriculture, forestry and fisheries production, while the formation of culture and beautiful scenery can revitalize rural areas and communities. These all make up the foundation for the development of nation's economy and well-being of citizens.

The MAFF devised the Ministry of Agriculture, Forestry and Fisheries' Biodiversity Strategy to promote a sustainable agriculture, forestry and fisheries industry harmonized with the natural environment of our country and is implementing support for sustainable agriculture such as organic agriculture, support for joint activities supporting multifunctionality of agriculture and rural areas, etc.

EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA BY TSUCHIURA CITY

Environmental Conservation Division, Tsuchiura City

Tsuchiura city has long been developed in close relation with Kasumigaura for agriculture, fishery, sightseeing and so on. However, the Lake water quality was deteriorated rapidly in the 1960s, due to modernization of lifestyle and industrial activities as well as population growth in the watershed, which consequently affected the lives of citizens in terms of offensive odors, musty smell in the tap water, and so on caused by fat formation of Aoko (blue-green algae). Under these circumstances, Tsuchiura city started financial assistance for those who installed johkasou that cleared certain level of treatment performance, to sewage system and rural community wastewater treatment, and initiatively implemented domestic wastewater countermeasures. As a result, the city has succeeded in reducing pollutant load into Lake Kasumigaura. In order to conserve and succeed rich nature including Lake Kasumigaura, the city considers environmental education to be the most important subject for fostering local attachment by experiencing its history and nature. The city provides various environmental educations for citizens of all generations. The city regards Lake Kasumigaura as an important resources of environment, culture and industry, and strives to establish sustainable ecosystem services.

EFFORTS TO IMPROVE WATER QUALITY BY THE TSUKUBA CITY

Environmental Conservation division, Tsukuba City

There are several rivers running through Tsukuba City, such as Sakura River, Kokai River, Yata River, and Hanamuro River. Tsukuba City has been carrying out a variety of measures for water quality conservation of these rivers. Measures include: Periodic patrol by water quality inspectors to prevent water pollution and illegal dumping; Cleaning of rivers annually by collecting trash in rivers and waste illegally dumped into rivers; "Full of Flowers Project" to plant flowers of the season every year along rivers; Awareness campaign with citizen's participation offering a variety of programmes especially for children at "Science Collabo" event held in every November at Oshimizu Park in Tsukuba City.

Exhibitions of Activities by Hosts

EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA BY KASUMIGAURA CITY

Life Environmental Section, Kasumigaura City

Kasumigaura City is located the southeast of Mt.Tsukuba. And it has gently slope from a central plateau to Kasumigaura lakeside in southeastern area. The main river flowed to Lake Kasumigaura in the city are Amanogawa river and Koiseigawa river in the north, Ichinose river and Hishikigawa river in the south. On ground of the natural environment, various farm products is grown, such that fruiter, paddy rice and lotus root. The farm products and the aquatic products gathered at Lake Kasumigaura, such that the smelt and the Japanese icefish, are important resource in our city.

In Kasumigaura City, we work on water quality survey and surveillance projects in city rivers and business sites, proceed environmental education projects and domestic wastewater purification countermeasure projects. In addition, we held the Satellite Kasumigaura events on the theme of "The City that coexist with Kasumigaura's rich ecosystem" in this year. And we have been discussing about the symbiosis relationship from the viewpoint of "food" and "culture" between the resources and people in Lake Kasumigaura by symbolizing "Hobikisen", the fishing sail boat, which is said to be a scenic feature of Lake Kasumigaura.

~ PARADISE FOR PEOPLE AND WILDLIFE ~ EXPANDING THE POWER OF NATURE IN NORTH KITAURA

Life Environmental Section, Hokota City

Hokota City has wetlands, including Kitaura Lake, and remains un untouched natural environment that can be said to be the original Japanese landscape. In particular, Hokota River, which is adjacent to the old central area of Hokota City and the wetlands of the Tomoe River basin, is home to various creatures and aquatic plants in the rich natural environment.

ENVIRONMENTAL CONSERVATION AND WISE USE AT HINUMA,IBARAKI TOWN

Green Environmental Section, Ibaraki Town

Ibaraki Town, located at the center of Ibaraki Prefecture, is a rural city with the peaceful living atmosphere that is blessed with a rich natural environment of water and greenery, such as "Hinuma Lake." Hinuma, the symbol of Ibaraki Town, is the only brackish water lake in the Kanto region of Japan (Tokyo metropolitan area). Represented by "Hinuma Ito-Tombo (Mortonagrion hirosei)" which is named after the lake, it provides habitats for the wide variety of wild species such as the migratory scaup "Suzugamo," "O-washi (Steller's Sea Eagle)," "Osekka (Marsh grassbird)" and many other flora and fauna. The beautiful scenery and abundant natural resources of Hinuma have long played a major role to sustain the local fishery and as a place of recreation as well. For these reasons, it was designated of the Ramsar Convention (Convention on Wetlands of International Importance especially as Waterfowl Habitat) in May 2015.

However, after entering the Showa era (after 1925), once Hinuma's water quality was deteriorated, and the original beauty has been impaired, due to the changes in the environment such as the increase of population of the river basin, economic growth, revetment maintenance, and reclamation project. In Ibaraki Town, we are promoting environmental conservation and the wise use of Hinuma, for the purpose of improving its function as a place of the habitat of various creatures and of promoting the regional progress.

Exhibitions of Activities by Hosts

MITO CITY ENVIRONMENTAL FAIR 2018

Environment Section, Mito City

Mito City is the prefectural capital located at a distance of about 100 kilometers from Tokyo with a population of about 270,000 people. Roughly in the center of the city is Kairakuen Park, which is one of the three great gardens of Japan, and Senba Lake. Mito City is a historical city where Mitsukuni Tokugawa, who is known as Mito Komon, and Yoshinobu Tokugawa, who was the last shogun, lived and many tourists visit its plum festival.

Senba Lake is a place where people can relax surrounded by nature and symbol of Mito City, however, because of the little water flowing into the lake, the outbreak of blue-green algae is an issue during summer months and the government and public have been engaged in measures against blue-green algae together.

For the Mito City Environmental Fair, a biotope challenging the public what to do to take over the responsibility for this rich nature in the future and events incorporating programs including fishing of non-native species and allowing the public to learn from experience were created. For the symposium, grown-ups and youths also had an earnest discussion and increased their awareness of the importance of environmental conservation.

Student Conference : Elementary School Students

OE1, P1 Examine the blessings from Kitaura's water environment, find the splendor of Kitaura, and clean Kitaura !

Hokota-shi Shiratori Nishi elementary school

Last year, we formed "Shiranishi Kitaura Conservation Group" and learned about the kinds of fish and plankton and water quality. Also, in a fisheries class by Komori foods, a local shop, we tasted the fishes caught in the lake. However, we knew that domestic wastewater is one of causes of Kitaura's pollution. So we hold an eco week to show Kitaura's goodness to other grades and local residents.

OE2, DE1 Story of salmon Ranger Corps 10 years

Sakasagawa Children's Eco Club Salmon Ranger team

Sakura River flowing through the city of Mito to improve the water quality, salmon run-up, doing the spawning from 2005. However, when the rubber dam to send the water to the paddy fields is standing, the water is to stagnation, eggs also will die also fry. Salmon Ranger Corps was formed in 2006, it has continued to work to protect the eggs before the dam is raised.

OE3 Breeding and protection of Musashi Tomiyo

Kumagaya Municipal Kuge Elementary School Eco-club Committee

Musashi Tomiyo is an endangered fish inhabiting only the upper reaches Motoarakawa River in Kumagaya-city. We take care of them in the school pond. This activity has three purposes. First, to let everyone know that Musashi Tomiyo exist. Second, to breed and protect them. Third, to have environmental learning. We have been doing this project for more than 30 years. we were able to raise 116 of them last year.

OE4, DE2 Kasumigaura Environment

Ukishima elementary School

We have known that Kasumigaura was very clean and we can even swim there. But now we can't. So we discussed about what we can do to improve Kasumigaura. We decided to clean first the surroundings by picking up garbage and at the same time, reduced the cause of dirtiness. We made posters to let everyone, be aware about prevention of garbage.

OE5, DE3, P2 To Save Our Mother Lake Kasumigaura

Tamari East Elementary School

Our school is located on the Lake Kasumigaura. In the integrated learning period, we learned about the lake from some points of view, like historical, industrial, biological and so on, associating with science and social studies. We also planted Yellow Floating Heart plants and picked up garbage. Through the learning, we considered what we can do to save our mother lake Kasumigaura.

Student Conference : Elementary School Students

OE6, DE4 The activities of Ramsar Biwa-Kids Ambassador

Ramsar Biwa-Kids Ambassadors

Ramsar Biwa-Kids Ambassador is an environmental education program targeting children to support sustainable environmental conservation effort and to train younger generation for future of Lake Biwa.

OE7, P3 To protect the environment of Lake Hinuma

Nagaoka Elementary School 4th grade

Nagaoka Elementary School is near Lake Hinuma. We want to protect the environment of Lake Hinuma. So we examine the water quality of Hinuma River, pick up garbages, resume activities of aluminum cans. We communicate the nature of Lake Hinuma and methods of water purification.

OE8 The Connection of Our Life and Kasumigaura

Tsuchiura Municipal Kamiootsu-higashi Elementary School 4th graders

Our way of life is centered on a coexistence with water that is found around Kasumigaura. We conducted a study that had children think about Kasumigaura carefully and take action towards the future through research on the close connection of our life and the lake environment.

OE9, P4 Water, Forests and People: Building sustainable water resource management in Northeastern Thailand

Metaneedol Elementary School, Thailand

Workshop on how important and role of the tree and forest on water resources, Learn ecosystem and water quality, Old generation transfer their believe and story to new generation, water management for organic- vegetable production. New generation increase their conservation mind to protect the forest and water. Believe and Culture inspire our environmental mind. Forest and tree have great importance for providing ecological services for people and community.

DE5, P5 Exploring the natural environment and aiming for symbiosis

Hokota-city Asahi north Elementary School

We created a new learning program for students from 3rd to 6th graders. It is from the view of ESD, and includes experiments and surveys of environment. The experts of natural environment helped them to make some surveys on the quality and biology of water in Oya River and Hinuma Lake. And our students have noticed that the industries like agriculture and fisheries have a strong connection with environment.

Student Conference : Elementary School Students

P6 Water Quality Rankings of Ponds in Tsukuba City Parks and Seasonal Variations from Spring to Summer

Doho Gakuen Tsukuba Municipal Ninomiya Elementary School

We investigated the water quality of ponds in eight city parks in Tsukuba in spring and summer by considering factors such as transparency, odor, color, chemical oxygen demand (COD), and phosphate ions (PO₄³⁻). A pond in Matsumi park was found to have the highest overall water quality, whereas that in Chuo park ranked the worst. Overall, the water quality of the ponds tended to deteriorate in the summer.

P7 Living things in Kasumigaura

Ukishima elementary School

We learned that in Kasumigaura the number of extraneous species increasing. On the other hand, we have to increase the number of Japanese species, like wakasagi. The fishermen advise us to apply artificial incubation. Finally we planted wakasagi in Kasumigaura.

P8 The water quality of Kasumigaura

Ukishima elementary School

Long time ago, Kasumigaura was very clear. But little by little it become very dirty. Cleaning the water in Kasumigaura will take a lot of time and money. So we should take good care of water and on the other hand, we should not waste water. We made posters to let everyone knows the importance of water.

P9 Protect the natural environment of the area Nature's grace and our present and future life

Ishioka City Kita Elementary School

A combined class of 4th grader and 5th grader conducted environmental learning on the theme of the local environment on the the Period for Integrated Studies schedule.

We studied the natural environment and nature's blessings in the school district and the Kasumigaura basin.

We thought about conservation of the environment and the future of the region.

DE6, P10 Investigate living creatures of Lake Biwa and local wetland

TANAKAMI children's Environment Club

We are investigating the living creatures of Lake Biwa and the living area. In order to make it an illustration we are examining it in four seasons. You can also see the characteristics of the creatures in the western part of Japan. Especially in Lake Biwa, we observe growth of one year mainly in Yoshi. We would like to cherish the living creatures of my hometown.

Student Conference : Elementary School Students

P11 Incubation methods of fairy shrimp,“Honen-ebi”through the examination of water quality of their habitat

Mishima elementary school

I found out that a species of fairy shrimp, a quasi-endangered species, live in our city, Tsukubamirai. I succeeded in collecting fairy shrimp eggs from a rice paddy field and hatching them. Fairy shrimp only appear in certain areas every year. Through this experiment, I determined how water quality affects hatching.

P12 Artificial insemination and hatching of WAKASAGI in Lake Kasumigaura -The food culture of wakasagi-

Kasumigaura City Kasumigaurakita Elementary School

Wakasagi is the representative fish of Lake Kasumigaura. We made artificial insemination and hatching of wakasagi. We ate delicious wakasagi fried and tempura there, and we learned from the fishermen. We found out that wakasagi has been cherished. Cause the fishermen are protecting the food culture of wakasagi by setting the anti-fishing period and making artificial insemination. Finally, we made the declaration to protect the environment of Lake Kasumigaura.

P13 A comparison of festivals in Kasumigaura City and Ishioka City-nature's blessings and culture

AOBADAI elementary & middle school ART CLUB FAMILIAR

In Kasumigaura City, Kasumigaura (lake) and Ishioka City, we made a comparison of the traditional Japan culture festival and Natural blessings. He actually listened to the craftsmen and went to the festival, and studied the history, costumes, and lion dances and the origins of the tour and legwork. In the end, the goal is to make many people aware of local festivals.

P14 How human should use water from the view points of other living creatures ?

Kaichi Nozomi Primary School

We will summarize our 3 years understanding for various living creatures (plants, insects, trees etc.) and water using the IB (International Baccalaureate) PYP (Primary Years Programme) 8 key concepts. Using this summary, we will discuss about how human should use water considering the view points of other living creatures.

Student Conference : Junior High School Students

OJ1, DJ1, P15 Komon-sama's Fireflies Revival Project

MITO EIKO JUNIOR HIGH SCHOOL Science Club

There is a place near our school where it was a rice paddy field, a place to relax, and where it was rich in fireflies 30 years ago. But now, the weeds grow crowded, and there is much illegal dumping trash. So, the members of the science club are working out to improve the environment of this place and make it a better place where fireflies and other various creatures can live.

OJ2, DJ2 Exploring Factors which Change the Water Quality of Kasumigaura

Miho Junior High School Science Club

Miho Junior High School Science Club continues water quality survey of Kasumigaura. We get sample from six points from Seimei River Estuary to Osukazu Drain Estuary. The survey is 13 items. Based on results, we know water quality. Additionally, we are exploring factors which change the water quality from difference of environment. From previous survey, we confirmed some items value differ greatly if points are different in Kasumigaura.

OJ3 Water environment around Toyosato junior high school and purification

Toyosato junior high school science club

We examined the water quality of the pond in the park near Toyosato junior high school and the water quality of the nearby river and how the organisms living there are related to the stability of water quality. In addition, we investigated the effect of *Bacillus natto* as bacterium useful for water purification.

OJ4, DJ3 Creating an environment of indigenous species and How to use invasive species

AOBADA elementary & middle school smile familia

[We want to continue to eating delicious fish!] And that is why we are interest in Kasumigaura and we want to fishes research. We breed the carp that in habit lake Kasumigaura and while observing it, we investigated the good environment of native fish. We also thought about how to cook of the invasive species that are to have a bad influence on the ecosystem.

OJ5 The valuable natural protection activity that I stay in an area

Ajigaura Junior high School Sawada Sukashiyuri research team

We have worked on the promotion of the environmental education and the environmental preservation in integrated study class in cooperation with our community for seventeen years.

We research and study endangered plants and animals around the Sawada Spring in Hitachi Seaside Park. Specifically, our class focuses on how to preserve and multiply the "Sukashiyuri flower".

Student Conference : Junior High School Students

OJ6, DJ4 How to appeal the wonderful waterside of Shiga

TANAKAMI children's Environment Club Middle school student team

We have been studying the nature and the wetland environment of Shiga prefecture since elementary school. There are lots of nice places, including Lake Biwa, in the wetland of Shiga Prefecture. Through river play and survey of living things, we thought that we must the wetland protect. In order to protect these wetlands, many people need to know. So find a way to appeal the wonderful wetland of Shiga.

OJ7 Current state of Ushiku-numa and investigation of water purification method

Ushiku 3rd junior high school Science Club

We have investigated the environmental changes in Ushiku-numa and we have tested the water purification function by native species. As a recent trend, the number of birds and dragonflies around Ushiku-numa were decreasing, and the COD value was high. Moreover, water quality purification test using native species as *Brasenia schreberi* and river snails showed possibility of improving the water quality of the swamp.

OJ8, DJ5, P16 A survey and experiment to improve the water quality of the Koise river

Kokufu junior high school Kokufu Environmental research club

Koise River flows alongside our school. I decided to do water quality survey of the river and cleanup of the revetment. As a result, the water quality of the river is good, but there are many such as dead grass of the revetment, and if these flow into the Lake Kasumigaura as it is, it becomes a load. From this, it turned out that it is important to conduct cleanup activities.

OJ9, P17 Solve the mystery of Satoyama invasion of bamboo thicket

Tsuchiura fourht juior high school Science Club

We knew that the area of bamboo thicket which is near our school is spreading year by year. To solve the mystery of the invasion to undeveloped woodland, we've researched about that for ten years. At the first, we began to investigate why the undergrowth doesn't grow in the bamboo thicket, and we thought there're roughly four factors. Specifically, soil, temperature, and natural sunlight. As the result, we found that soil is the biggest factors of the invasion.

DJ6, P18 The Features of Cyrenidae in Hinuma

Chigakukan Secondary School IS-Scientific Course 1

The lake Hinuma is famous for cyrenidae. "Kisuike Hinuma" says the cyrenidae from it are of a high quality. However, it is difficult to express the reason they tasted so good. The more detail we learned about the cyrenidae's flavor, the better we could explain what makes them such high quality. We carried out research pertaining to the weight, shape, design, and taste of the cyrenidae.

Student Conference : Junior High School Students

P19 Hinuma Produces a New Menu by Local Production for Local Consumption

Chigakukan Secondary School IS-Scientific Course 2

Due to the Ramsar Convention Hinuma lake has received an increased level of public awareness, which has been of benefit to the local facilities. We plan to develop a new menu based on nature conservation and sightseeing. We propose that in order to appeal to tourists, special dishes using foodstuffs and special products from the three towns and villages should be created.

P20 Water Transportation System in Early Modern Hinuma Area

Chigakukan Secondary School IS-Scientific Course 3

In the Edo period, the water transportation system in the Hinuma area influenced the surrounding towns. We would like to know about the relation between Hinuma and the local people. We hypothesized that; human capital and resources were moved using the water transportation system, which then revitalized the local economy. We plan to research various books for references.

P21 Action to bring up consciousness from a variety of experience-based activity to environment

yachiyo eco club

Through experience-based activity ('learning) about nature and the environment, I notice a connection with one's life and bring up a child acting with consciousness of the environmental protection.

As concrete content, I carry out an investigation, the exploration, nature, observation, an interchange event.

Through experience-based activity, be tied to one's life from local splendor and the environmental problem that I noticed and I think about what you can do and act.

P22 Water Quality of Lake Kasumigaura

Ami Junior High School Science Club

The purpose of this research is to continuously investigate the water quality of Kasumigaura and the incoming river, to clarify the relation between water quality and nutrients and the degree of contamination of the lake. As a result of continuing measurement for several years, we found that the quality of water changes with seasons and places

P23 We follow a waterside with the oldness

Ogawa minami Junior high school

Sonobe River is one of a certain imminent river near our school. We checked the quality of the water investigation in our school two years ago and 12 years ago. We checked how the quality of the water of Sonobe River was changed. We think about the present environment of the Sonobe River while comparing it with the past investigation.

Student Conference : Junior High School Students

P24 Search for sweet potatoes in Kasumigaura ~ Regional-food relationship ~

AOBADAI elementary & middle school

About Sweet Potato in Kasumigaura City Suitable for Cultivation Environment, "taste", "texture", "color" were compared. We investigate variety, cultivation method, regional environment, cooking method and aim for new product development. Eventually we would like to introduce the ideal product for the outside school and we would like to thank the nature's blessings.

P25 Species Richness and Distribution of Macroinvertebrates as Water Quality Bioindicator in Lake Dakong Napo and Agusan River, Mindanao Island, Philippines

SIBAGAT NATIONAL HIGH SCHOOL OF HOME INDUSTRIES

This study aims to determine the species richness and distribution of macroinvertebrates as water quality bioindicator in Lake Dakong Napo and Agusan River, Mindanao Island, Philippines. A total of 186 individuals belonging to 16 families were collected and identified.

Student Conference : High School Students

OH1, P26 Let's make Ibarakimachi more energetic! ~ The ECO activities of Ibaraki Higashi Senior High School ~

Ibaraki Prefectural Ibaraki Higashi Senior High School [We are Hinumakko!]

"We are Hinumakko !" is the nature environment preservation activity group established through the 3 years' learning at Ibaraki Higashi Senior High School.

The main activities are the making of the acrylic scrubbing brushes which enable us to remove the dirt with little detergent to preserve the water of Hinuma and their public awareness campaigns. We've also maintained school possession forests to preserve the water.

OH2, DH1, P63 The musical tells conservation activities of lakes and water birds

Cinderella, A Musical Company

We belong to the musical theatrical company, the name of "Cinderella musical company." We are performing wonderful musicals, with the themes of "dreams, hopes, adventures and conservation of nature." We presentation is the contribution and effect to the conservation activity of lakes and water birds by the Cinderella's musical activity.

OH3, DH2 A firefly regeneration project in Moriyama City

Shiga prefectural Moriyama junior/high school SGH firefly regeneration research team

Our city, Moriyama was once famous for its fireflies. However, the number of them has drastically decreased due to environmental changes. So, we conducted some surveys to grasp citizen's awareness of fireflies and the current situation we are facing so that we will be able to find some ways to the solution. By regenerating suitable environment for them, we are aiming to increase the number of them flying in Moriyama.

OH4, DH3, P27 Growing the ancient rice at "Yatsuda" in Shishizuka and the seasonal change in the freshwater plankton

Ibaraki Prefectural Takezono High School

We cultivated a rice field and have grown an ancient rice by using the natural firming method which means "organic" and "non-fertilizer" in the local forest area named Shishizuka near Kasumigaura.

Since this sort of rice field becomes the valuable wildlife habitats, we are also investigating the environmental effects including the seasonal changes of freshwater planktons, the water quality survey, and their relationship with rice growth.

OH5, DH4, P28 Efforts to solve the problem of waste garbage caused by inland parts in downstream waters

SANYO Girls Senior Junior High School Geography and History Club

Although the marine garbage problem in the Seto Inland Sea is recognized as an environmental problem peculiar to the coastal area. But the degree of recognition of marine garbage is low enough to go away from the coast. Therefore, by encouraging inland areas as well as the coastal area, mutual understanding and common recognition were encouraged.

Student Conference : High School Students

OH6, P29 Research of the Ecosystem in Lake Tazawa

Omagari Agricultural High School Bioengineering Club

Our research concerns plankton and the feeding habits of the big-scaled redbfin (*Tribolodon hakonensis*) in Lake Tazawa. We carried out this research to gain a deeper understanding of the lake's ecosystem. The results suggest that the lake's ecosystem is imbalanced and that it may be possible to restore equilibrium by using plankton. In the future, we would like to revitalize the ecosystem for the sake of the many organisms in it.

OH7, DH5 Blue-green algae and measures the results of Senbako

Sakasagawa Children's Eco Club Senbako biotope team

Senbako "While there have been a water conveyance and liquidity measures from Sakuragawa, there is a generation of blue-green algae. Start a biotope development from 2012 called on citizens at the club. Every year, children will participate 200 people, aquatic plant of 20,000 shares were planted in the water in seven years.

Lower the nitrogen and phosphorus, the organism increases, the results of water purification has been obtained.

OH8, DH6, P30 The development of the new flocculants made from natural material

Seifu Junior and Senior high School Biology club

Our biology club has been trying to preserve a rare species of fish, the Japanese rosy bitterling, for 18 years in a pond located in Yao, Osaka. we need to make the water quality better and to restore the biodiversity by finding a new method for cohering and removing the water bloom.

OH9 Water clarification system by organisms

Aomori Prefectural Nakui Agricultural High School TEAM FLORA PHOTONICS

Water pollution of lakes caused by eutrophication occurs in the world. So we made a new system for water clarification using biological functions. This system does not use electric power or fossil fuel. So we can use this system wherever in the world.

P31 Production and installation of a water hammer pump for winter watering rice paddy making

Chiba prefectural Matsudo Minami high School Science and Research Club / Water hammer pump Team

It's from a rice planting period to early summer to fill a rice paddy with water. But the Japanese native breed (ex. a killifishes and a frogs) requires a shallow water place through a year. In order to maintain paddy ecosystem we tried create and install a water hammer pump can pump water with no electricity throughout the year.

Student Conference : High School Students

P32 Making and practical use of the water plant gage for ecosystem revival of lakes and marshes

Chiba prefectural Matsudo Minami high School Science and Research Club / Water Plant Gage Team

In 1960s, the ecosystem of the lakes and marshes collapsed seriously by wastewater from people. Although it has been improved, many ecosystems have not been restored. This is considered because the aquatic plants do not regrow. A water plant was eaten up as feed of waterfowls, crustaceans and fish, so we try to develop the protection gage from which the period until a water plant grows big.

P33 The color differences of sijimi and the water quality of its spot

Tokiwa University High School

Lake Hinuma is a large brackish lake located 5km inland from Oarai Beach on the Pacific coast in Ibaraki. Shijimi, one species of corbicula clam, can be found there. A water quality test and ecosystem observation were conducted in Hinuma. Through our investigation, it became clear that the color differences of sijimi are related to the water quality of its spot.

P34 Influence from surrounding environment on water quality - contrast between the Nakagawa waters and Kasumigaura waters -

Mito Agricultural High School Natural Science Club

Currently, we are continuously studying the impact of agriculture on ecosystems. In our research, we have a question if the ecosystems of our school is affected only by the agricultural activities carried out inside the school. Therefore, we decide to discuss Nakagawa river, which is located about 2 km from our school, influence the ecosystems of our school.

P35 Water quality survey of Lake Biwa and rivers around the school

Seta technical high school Chemical industry

- We conduct water quality survey activities in Lake Biwa, Seta river and its river basin, analyze the observation data together, and know the current situation of the environment
- Collaborate with regional NPO corporations and broadly grasp the relationship with the environment by developing environmental conservation activities

P36 Water Quality Research in rivers around Hokuzan High School (Zininsa river, Shigema river, Ooi river)

Hokuzan High School Biology Club/Water Quality Research Team

We investigated the water quality of 3 rivers near Hokuzan High School. We examined water temperature, transparency, and 6 items with a Pack Test. We comprehensively evaluated the results of Pack Test, and arranged the river's water qualities from best to worst, Shigema River, Zininsa River, and Ooi River respectively. Besides, the upper stream water quality is more polluted than the midstream in Ooi River.

Student Conference : High School Students

P37 River Research in Nakijin village -Environmental evaluation of aquatic animals and water quality-

Hokuzan High School Biology Club/Indicator Species Research Team

We investigated Aquatic animals and water quality in Shigema River running near Nakijin Castle Ruin, a world heritage site, and Ooi River running near Shiina Castle Ruin. The aquatic animals which we investigated were mainly indicator Species. We examined water temperature, transparency, and 6 items with a Pack Test. Because of the results of analysis, Shigema River has a better river environmental condition than that of Ooi River.

P38 Proposals to reduce pollution in the Shinkawa River

Tsukuba International University High School

The Shinkawa river which closely runs along our school has been historically used for flood control purposes. However, due to the lack of environmental awareness, the river has become a source of pollution.

We researched the history, topography, water quality, public opinion and success stories from similar polluted rivers. We conclude with three potential solutions which apply the concept of community and shared ownership of the river by the neighboring areas.

P39 Water quality and aquatic organism of Nagamo river

Hokota second high school Biology Club

In Nagamo river which flow near the our school, about seasonal change of water quality and aquatic organism, survey area of revetment were compared to the survey area that is no revetment. About the water quality, the COD decreased from July through December and increased afterwards. In both investigation place the number of the kinds of the aquatic wasn't the big difference.

P40 Effect of divalent iron ion on aquatic environment

Kanagawa Prefectural Maritime Science High School

Divalent iron ion has been found to have various water quality improvement effects such as plant growth, activation of other organisms resulting therefrom, and water quality purification action by adsorbing and fixing phosphorus, which causes Eutrophication. In this study, we focused attention on the water quality improvement effect by this divalent iron ion as a countermeasure against water area problem such as Microcystis blooms and Sludge.

P41 A study on the value of agricultural products grown using fertilizer made from water weeds from Lake Biwa

Shiga prefectural Moriyama junior/high school SGH water weed research team

Overgrown water plants are causing environmental problems in Lake Biwa. Shiga prefecture removes water plants, makes compost from them and provides it for free. However, it's difficult to continue the process because it costs a lot of tax money. We're now studying how to make the system a self-sufficient process by examining the value of water plants and creating branded agricultural products made with water-plant compost.

Student Conference : High School Students

P42 Comparison of water quality survey and biological survey of Okita river and Hanazono river

Isoharakyouei High School Science Club

Isoharakyouei High School science club has been conducting a ten-years biological survey of Okita river and Hanazono river. The distance between observation points of both rivers is only 2 km. But there is a quite difference of aquatic animals between the two points. Therefore we conducted a water quality survey from 2014, and we considered whether the difference was due to the water qualities.

P43 Development of the Microbial Fuel Cell using the mud of the Lake Kasumigaura

Meikei High School Science Club / biology group

The purpose of this study is to use Microbial Fuel Cell made of mud. We had prepared mud in three places at Lake Kasumigaura and checked whether they generated electricity. As a result we learned that the mud in which generated highest electricity was the one in reed field. The electromotive force of the mud of reed field is 230mV.

P44 Purify water in Kasumigaura using only natural things

Meikei High School Chemistry Club

These days, the water pollution of Kasumigaura Lake is getting serious. It would effect the people health if it become more worse. But we found bannana peel is effective against the water pollution on the news. So we tried to purify the water by natural things as like charcoal.

P45 A study of golden membrane and the water quality of the habitat of Hikarimo in Higashi-Namekawa Seaside Park

Hitachi First Senior High School Biology Club

There are many caverns in the Higashi-Namekawa Seaside Park of Hitachi City, Ibaraki Prefecture. There golden membrane is seen on the water surface, which is composed of great numbers of Hikarimo. Hikarimo is a single-celled creature living in the freshwater. This study is to investigate the water quality of the habitat where the Hikarimo lives. The water contains high COD and low NH₄-N. Its pH was around 6.

P46 Connection with familiar water

Toyo University Ushiku Senior High School SOCIUS

Japan has abundant water resources to use for daily life including drinking water. However, although this is different from such underground resources as would be lost if used, it is still a limited resource and therefore, it is necessary for us to make effective use.

We've surveyed our awareness about water around drinking water and examined what the best way is to face water.

Student Conference : High School Students

P47 Research on freshwater turtles in Kobe, and conservation activities for Japanese domestic pond turtles

Kobe Yamate Girls' High School Kame-Love

The research was carried out in Chuo-ku ward, Kobe. The population was mainly Red-eared sliders and Chinese three-keeled pond turtles, and Japanese pond turtles were rarely noticed in the habitat. We examine the ecosystem of the species in the artificial environment, Kobe City Sorakuen Garden, if there would be possibility for them to live in the new surroundings by the donation of the species by Suma Aqualife Park In Kobe.

P48 HIKARIMO (*Ochromonas vischeri*) in Mito City

Mito Daini senior high school Science Club

HIKARIMO (*Ochromonas vischeri*) have been in the cave of Bizen Town in Mito City. However they have been reflecting light only a part of places. As a result of our resurch, it is considered that the cause of their disappearance is the lack of nutrient salt.

P49 Survey of water quality and fauna of the Tonbo pond

Ibaraki Nature Museum Junior Staff

There are many creatures in the pond of Tonbo at Ibaraki Natural Museum's outdoor facility. In the last fiscal year, pond drying was done. Thereby, it seems that many juveniles of Eastern-Japanese Common toads that had not been seen so far landed and the environment of the pond changed. In this research, we investigate the water quality and fauna of the pond and consider the situation of the pond.

P50 The Relationship between the Bluegills' Survival and the Covered Area of the Water Chestnuts in Mikata Lake

Wakasa high shool 3rd science and mathmatics course, The Bluegill Team

We have clarified the ecology of the bluegills in Mikata Lake. Last year, we focused on ① verifying the earlier research* and the average length of them, and on ② comparing Mikata Lake with other area through the questionnaires. (*The earlier research said "The bluegills in Mikata Lake have two spawning seasons, and the survival rate of the earlier term group relates to the covered area of the water chestnuts.")

P51 Phototaxis by color in visible light of aquatic organisms

Tsuchiura Third High School Science Club

I've bred many aquatic organisms at home so I was curious to understand how fish see around them. I investigated the wavelength range that aquatic organisms may prefer in the visible light regions. Using Guppy and Tanishi, we experimented with red, blue, green, and ultraviolet colors simultaneously in the same glass tank, 45cm where fish could swim freely among the colors. Observations show that the green and ultraviolet lights are less crowded.

Student Conference : High School Students

P52 Is it possible to place Lake Kasumigaura on a waterfield ?

Tutiura third high school science Club

I heard the streets in Tsuchiura city were crowded in the old days, now there is less traffic. Kasumigaura Lake can be used to revive the city. In the 1940s, this lake was used as an airport by the Navy, with unique vehicles called flying boats. We can reopen this airport, offering patrons the options for multiple destinations. US-2 can be used as the supplier.

P53 Microorganisms growing in the beaker. Is there correlation with Kasumigaura?

Tsuchiura third high school Science club

We examined rainwater in a bucket in the science's room veranda and found that cyanobacteria was formed. Water was taken from the tap and placed in beakers which were also left on the veranda; one was placed in the shade. The experiment was geared towards finding out if there was any correlation between the microorganisms in the beakers and Kasumigaura. Against our expectations, the beaker in the shade produced more microorganisms.

P54 The effort of effective use method of Ulva which overflow at Yatsu-Higata Tidal Flat

Chiba Prefectural Tsudanuma High School Science Club / Biology Team

Now, Yatsu-Higata Tidal Flat faced environmental problem which is a persistent green tide of floating Ulva. When the Ulva is spoiled, it give off a bad smell around a residential quarter.

So we have studied for effective use method of Ulva from various viewpoints. The experiment on which we're putting the emphasis in particular becomes bioethanol. Besides an effort to image improvement of Ulva is being also done.

P55 Medaka circumstances in Lake Biwa, Yodo River basin, Tanakami district ~ Through DNA appraisal of medaka inhabiting lakes, rivers and rice field ~

TANAKAMI children's Environment Club

This research began by examining the DNA of medaka that lives in Mt. Tanakami in the Otsu city, Shiga Prefecture. It was found that the medaka in the pond near Tanakami mountain top is released. I examine habitat status of Medaka in the Tanakami region deeply connected to Lake Biwa and Yodo River. We must spread the danger of discharging and stop the actions leading to further wild species reduction.

P56 The feeding habit of Red-eared slider in Mikata Lake

Fukui prefectural Wakasa high school

In Mikata Lake recently increase of Red-eared slider which is a foreign creature can have been admitted now. But it isn't studied about its reality. So I am trying to elucidate the ecology and investigate the competition of food had happened between the native breed.

Student Conference : High School Students

P57 Evaluation of nutrients removal by triangle sail mussel (*Hyriopsis cumingii*) in Lake Kasumigaura

Tsuchiura First High School Biology Club

We performed the experiments for the water purification ability of triangle sail mussel (*Hyriopsis cumingii*), which was cultivated to produce freshwater pearls in Lake Kasumigaura. We analyzed the change of the amount of N, P and COD in the water, and quantified the degree of contribution for prevention of eutrophication by the filter feeding mussel in L. Kasumigaura

P58 Relation between life and the Water, between Science and the Water in Lake Kasumigaura ① Historical Background ② Gelation Experiment

Tsuchiura Nihon Univ. High School Current topics and Society Study Club Science Club

By examining human life in the past based on the previous studies and statistic data, we define the importance of water resource. In order to improve the water quality of Lake Kasumigaura, we propose the easy but practical method in which sodium alginate is used to gelate sewage and remove it. Generated gel can be also utilized as fertilizer. We plan to continue to investigate the best condition of it.

P59 Discussion on biological system and alien fishes in Lake Kasumigaura

Mitsukaido Primary High School

A bluegill and an ictalurus punctatus were captured in Lake Kasumigaura. I report a method to catch the fishes and figure of the alien fishes. Discussion on relationship between native fishes and alien fishes and future environment system of Lake Kasumigaura will be carried out.

P60 Chnages of fish fauna of Lake Senba

Ibaraki high school

We conducted a fauna survey in Lake Senba by catching fishes from 1990 to 2017. We found a lot of carps and morokos, which are known to be tolerant of water pollution and highly adaptable to environmental changes. In recent years, extreme eutrophication has been observed in Lake Senba. In addition, alien fishes have been found. We are concerned about its influence on creatures living in the lake.

P61 About living together with nature and humans

Torideseitoku school drama club & karuta club

[what is symbiosis ?] , [can humans live together with nature ?]

We have discussions about these topic in every week after school.

This is the record of the opinions and thoughts which appeared while we discussed the topic.

Our conclusion is that people can't live with nature , so far we have tried to consider the topic carefully.

Student Conference : High School Students

P62 Distribution and Diversity of Freshwater Crustaceans (Arthropoda: Crustacea) with Notes on Socio-economically Important Species in Lake Dakong Napo, Esperanza, Mindanao Island, Philippines

SIBAGAT NATIONAL HIGH SCHOOL OF HOME INDUSTRIES

This study aims to determine the distribution and diversity of freshwater crustaceans in Lake Dakong Napo, Mindanao Island, Philippines. 250 individuals freshwater crabs and shrimps belonging to 3 families were collected and identified IN Lake Dakong Napo. Two species under the family of Atyidae were documented particularly *Caridina gracilirostris* and *Paratya* sp., two species under the family Palaemonida were recorded *Macrobrachium rosenbergii*, *Macrobrachium* sp. and *Palaemonid* sp.

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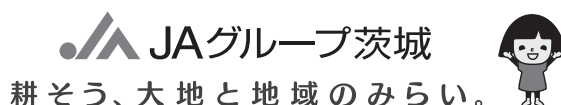
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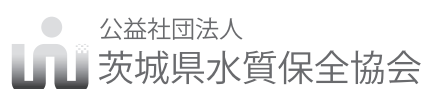
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	Kazuo Kyuma	President, National Agriculture and Food Research Organization
	Saburo Matsui	Chairperson, 17th World Lake Conference Project Promotion Committee
	Nobuo Mimura	President, Ibaraki University
	Kyosuke Nagata	President, University of Tsukuba
	Kiyoshi Nakagawa	Chairperson, Ibaraki Association of City Mayors/ Mayor, Tsuchiura City/ Chairperson, Council to Resolve Pollution Problems In Lake Kasumigaura
	Tsuneo Nakahara	Director of Mito Station, NHK
	Kazuo Nakayama	Chairperson, Ibaraki River Association
	Kazuhiro Nishikawa	President, Public Works Research Institute
	Shun Onodera	Vice Governor, Ibaraki Prefecture
	Takashi Otabe	President, The Ibaraki Shimbun
	Yoko Sakurai	Chairperson, Ibaraki Liaison Committee of Regional Women's Organizations
	Osamu Sano	Chairperson, Ibaraki Agricultural Cooperatives Association/ Chairperson, Ibaraki Livestock Industry Association
	Morio Someya	Chairperson, Ibaraki Association of Towns and Villages
	Yasushi Takahashi	Mayor, Mito City
	Noriyuki Takasugi	Chairperson, Ibaraki Federation of Inlandwater Fisheries Cooperatives
	Satoshi Tanaka	Director-General, Environmental Management Bureau, Ministry of the Environment
	Toru Tsuboi	Mayor, Kasumigaura City
	Hirokazu Tsukahara	Director-General, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Seiki Usui	President, Kasumigaura Fisheries Cooperative
	Chiho Watanabe	President, National Institute for Environmental Studies
	Takeshi Watanabe	Chairperson, Economic Council of Ibaraki
	Tsuneo Yamaoka	Chairperson, Ibaraki Prefectural Assembly
Auditors	Yasuo Imazeki	Director and Secretary General, Ibaraki Association of City Mayors, Ibaraki Association of Towns and Villages
	Hideki Kakuta	Accounting official, Ibaraki Prefecture

(2) Project Promotion Committee

Chairperson	Saburo Matsui	Trustees, International Lake Environment Committee Foundation
Vice chairperson	Takehiko Fukushima	Center Director, Ibaraki Kasumigaura Environmental Science Center
Vice chairperson	Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation
Members	Kaoru Abe	Director, Division of Biogeochemical Cycles, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization
	Hideaki Goto	Deputy Mayor, Tsuchiura City
	Koji Hino	Director General, Dam Project Department, Headquarters of Dam Affairs, Japan Water Agency
	Shigekazu Ichiki	Secretary-General, International Lake Environment Committee Foundation
	Kazuo Ichimura	Chairperson, 2018 Citizens' Association that works closely with the World Lake Conference
	Tetsuo Iino	Deputy Mayor, Tsukuba City
	Akio Imai	Head, Lake Biwa Branch Office, National Institute for Environmental Studies
	Makoto Kagawa	Professor Emeritus, Ryutsu Keizai University
	Yuichi Kayaba	Director, Water Environment Research Group, Public Works Research Institute
	Hirobumi Kobayashi	Deputy Mayor, Ibaraki Town
	Yoshijirou Kobayashi	Executive Director, -Challenge Ibaraki- Residents Movement
	Kazuya Kumagai	Director, Water Environment Division, Environmental Management Bureau, Ministry of the Environment
	Hisao Kuroda	Professor, Department of Regional and Comprehensive Agriculture, College of Agriculture, Ibaraki University
	Masakazu Mitsunari	Director of River Environment Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Ichiro Nakagawa	Director of Environment Policy Office, Policy Planning Division, Ministry of Agriculture, Forestry and Fisheries
	Reiko Nakamura	Secretary-General, Ramsar Center Japan
	Yoshiro Ono	President, Japan Society on Water Environment/ Professor and Vice President, Kyoto Institute of Technology
	Akira Saito	Director General, Department of Residential and Environmental Affairs, Ibaraki Prefecture
	Hisanobu Sato	Director, River Department, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Shunichi Shioya	Director, Rural Development Division, Kanto Regional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries
	Mitsuru Tajiri	Deputy Mayor, Mito City
	Toshiyuki Terakado	Deputy Mayor, Hokota City
	Motoo Utsumi	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba
	Hiroya Yamano	Director, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies
	Norio Yokose	Deputy Mayor, Kasumigaura City

(3) Technical Sessions Steering Committee

Chairperson	Takehiko Fukushima	Center Director, Ibaraki Kasumigaura Environmental Science Center
Members	Kunihiko Amano	Director, River Department, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism
	Hiroaki Furumai	Professor, Research Center for Water Environment Technology, Graduate School of Engineering, The University of Tokyo
	Akio Imai	Head, Lake Biwa Branch office, National Institute for Environmental Studies
	Makoto Kagawa	Professor Emeritus, Ryutsu Keizai University
	Hisao Kuroda	Professor, Department of Regional and Comprehensive Agriculture, College of Agriculture, Ibaraki University
	Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation
	Kahoru Ogawa	Director, Kahoru Ogawa Environmental Education Office
	Hiroaki Tanaka	Professor, Research Center for Environmental Quality Management, Graduate School of Engineering, Kyoto University
	Hiroya Yamano	Director, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies

(4) Technical Sessions Working Group

Technical Session 1

Chairperson	Masatoshi Denda	Senior Researcher, Water Environment Research Group, Public Works Research Institute
	Kohji Mabuchi	Senior Researcher, Lake Biwa Branch office, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies
	Jun Nishihiro	Associate Professor, Department of Environmental Science, Faculty of Science, Toho University
	Hiroya Yamano	Director, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies
	Takehito Yoshida	Associate Professor, Department of General Systems Studies, The University of Tokyo

Technical Session 2

Chairperson	Kunihiko Amano	Director, River Department, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism
	Toshiharu Kataoka	Director, Environmental Division, Tonegawa Karyu Integrated Operation and Maintenance Office, Japan Water Agency
	Sachio Oguri	Deputy General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Makoto Umeda	Associate Professor, Graduate School of Engineering, Department of Civil and Environmental Engineering, Tohoku University
	Hiroshi Yajima	Deputy Director Professor, Estuary Research Center, Shimane University

Technical Session 3

Chairperson	Kazuhide Hayakawa	Deputy Division Director, System analysis Division, Lake Biwa Environmental Research Institute
	Akio Imai	Head, Lake Biwa Branch office, National Institute for Environmental Studies
	Zin'ichi Karube	Lecturer, department of Biotechnology and Chemistry, Faculty of Engineering, Kindai University
	Ayato Kozu	Head, Center for Regional Environmental Research Lake and River Environment Section, National Institute for Environmental Studies
	Motoo Utsumi	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba

Technical Session 4

Chairperson	Makoto Kagawa	Professor Emeritus, Ryutsu Keizai University
	Hiroshi Nagai	Chief director, Historical Materials and Liberal Arts Department, Ibaraki Prefectural Archives and Museum
	Satoshi Nagano	Associate Professor, College of Social Sciences, Ritsumeikan University
	Atsushi Numazawa	Research Advisor, Kasumigaura Citizens' Association
	Yang Ping	senior research scientist, Lake Biwa Museum
	Kentaro Tamino	Professor, Faculty of Health & Sport Sciences, Ryutsu Keizai University
	Hironobu Wakatsuki	Associate Professor, Department of Business Administration, Kinjo College

Technical Session 5

Chairperson	Sadao Eguchi	Leader, Soil, Water and Nutrient Cycle Unit, Division of Biogeochemical Cycles, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization
	Tomijiro Kubota	Leader, Hydrology and Water Resources Unit, Division of Regional Resources Engineering, Institute for Rural Engineering, National Agriculture and Food Research Organization
	Hisao Kuroda	Professor, Department of Regional and Comprehensive Agriculture, College of Agriculture, Ibaraki University
	Kazuya Nishina	Senior Researcher, Soil Environment Section, Center for Regional Environmental Research, National Institute for Environmental Studies
	Masaru Yamaoka	Leader, Aquatic Environmental Engineering Unit, Division of Hydraulic Engineering, Institute for Rural Engineering, National Agriculture and Food Research Organization

Technical Session 6

Chairperson	Ichiro Embutsu	Chief Researcher, Center for Technology Innovation-Control, Hitachi Research Institute, Research and Development Group, Hitachi, Ltd.
	Bunkei Matsushita	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba
	Keigo Nakamura	Senior Researcher, Water Environment Research Group, Public Works Research Institute/Director, Aqua Restoration Research Center, Public Works Research Institute
	Shin-ichi Nakano	Professor, Center for Ecological Research, Kyoto University
	Hiroaki Tanaka	Professor, Research Center for Environmental Quality Management, Graduate School of Engineering, Kyoto University
	Hiroaki Tao	Director - General AIST Shikoku, National Institute of Advanced Industrial Science and Technology

Technical Session 7

Chairperson	Masafumi Fujita	Associate Professor, Urban and Civil Engineering, Graduate School of Science and Engineering (Engineering)Department, Ibaraki University
	Hiroaki Furumai	Professor, Research Center for Water Environment Technology, Graduate School of Engineering, The University of Tokyo
	Ikou Kasuga	Associate Professor, Water Environment Technology Lab, Urban Environmental Engineering Course, Department of Urban Engineering, Graduate School of Engineering, The University of Tokyo
	Kazuhiro Komatsu	Senior Researcher, Lake and River Environment Section, Center for Regional Environmental Research, National Institute for Environmental Studies
	Hitoshi Tanaka	Group Reader, Senior Researcher, Water Environment Group, Center for Environmental Science in Saitama

Technical Session 8

Chairperson	Tai Harada	director, Specified Non-profit Organization Kasumigaura Academy
	Shinji Ide	Professor, School of Environmental Science, the University of Shiga Prefecture
	Munetsugu Kawashima	Professor Emeritus, Shiga University
	Kahoru Ogawa	Director, Kahoru Ogawa Environmental Education Office
	Hiroshi Oikawa	Director General, Certified Non-profit Organization for Nature Conservation and History Transmission of Shishitsuka Satoyama

Technical Session 9

Chairperson	Isao Endo	Fellow, Institute for Global Environment Strategies
	Naoko Hirayama	Assistant Professor, Department of Environmental Policy and Planning, School of Environmental Science, University of Shiga Prefecture
	Victor Shiholo Muhandiki	Senior Researcher, International Lake Environment Committee Foundation
	Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation
	Keiko Wada	Deputy Director, Institute of Lake Biwa-Yodo River Water Environmental Research, Lake Biwa-Yodo River Water Quality Preservation Organization

(5) Lake Kasumigaura Session Committee

Chairperson	Takehiko Fukushima	Director, Ibaraki Kasumigaura Environmental Science Center
Members	Takehiko Fukushima	President, Kitaura Wide Sea-area Fisheries Cooperative
	Ichiro Fukaya	Senior Director, Ibaraki Agricultural Cooperative Association
	Masanori Hirohara	Manager, Life Environmental Section, Civic Division, Kasumigaura City
	Tomio Kobayashi	Manager, Production Engineering Environment Section, Production Division, Kanto Regional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries
	Kazuya Kumagai	Director, Water Environment Division, Environmental Management Bureau, Ministry of the Environment
	Shinichiro Matsuzaki	Senior Researcher, Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies
	Kazuhiro Mizuta	Manager, Environmental Conservation Section, Civic Life Division, Tsuchiura City
	Motohiko Sano	Senior Director, Ibaraki Livestock Industry Association
	Yoshihiro Sugaya	Manager, Life Environmental Section, Civic Division, Hokota City
	Yukio Suzuki	Economic Council of Ibaraki (Kasumigaura Society of Commerce and Industry)
	Toshio Takishita	Vice President (Kasumi session), 2018 Citizens' Association that works closely with the World Lake Conference
	Tsuyoshi Tatsuno	General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Seiki Usui	President, Kasumigaura Fisheries Cooperative
	Motoo Utsumi	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba
	Koji Yoshikawa	Head of River Environment Division, River Department, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism

(6) Lakes Session Committee

Chairperson	Takehiko Fukushima	Director, Ibaraki Kasumigaura Environmental Science Center
Members	Kaoru Abe	Director, Division of Biogeochemical Cycles, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization
	Yayoi Funahashi	Director for River Environment Coordination, River Environment Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Eiichi Hayashi	Manager, Environmental Section, Life Environmental Division, Mito City
	Shinji Ide	Professor, School of Environmental Science, the University of Shiga Prefecture
	Akio Imai	Head, Lake Biwa Branch Office, National Institute for Environmental Studies
	Yuichi Kayaba	Director, Water Environment Research Group, Public Works Research Institute
	Naoki Komatsu	Director General, Shiga Prefectural Government
	Ayato Kozu	Head, Center for Regional Environmental Research Lake and River Environment Section, National Institute for Environmental Studies
	Kazuya Kumagai	Director, Water Environment Division, Environmental Management Bureau, Ministry of the Environment
	Mitsugu Kuroda	Manager, Green Environmental Section, Life Economic Division, Ibaraki Town
	Reiko Nakamura	Secretary-General, Ramsar Center Japan
	Mieko Otani	Secretary-General, -Challenge Ibaraki- Residents Movement
	Kai-Qin XU	Principal Researcher, Center for Material Cycles and Waste Management Research, National Institute for Environmental Studies
	Hiroshi Yamaguchi	Director General, River Environment Division, Land Development Department, Chiba Prefecture
	Koji Yoshikawa	Head of River Environment Division, River Department, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism

(7) Satellite Venue Coordination Committee

Chairperson	Shigeki Kurita	Director, Environmental Management Division, Department of Civil Affairs and the Environment, Ibaraki Prefecture
Members	Akira Abe	Vice President(working with Tsuchiura City), 2018 Citizens' Association that works closely with the World Lake Conference (Kasumigaura Citizens' Association)
	Eiichi Hayashi	Manager, Environmental Section, Life Environmental Division, Mito City
	Masanori Hirohara	Manager, Life Environmental Section, Civic Division, Kasumigaura City
	Toshio Iitsuka	Vice Chairperson (working with Kasumigaura City), 2018 Citizens' Association that works closely with the World Lake Conference (Household Effluent Purification Promotion Group of Kasumigaura City)
	Masahiko Koike	Deputy General Manager, Kasumigaura Conveyance Work Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Mitsugu Kuroda	Manager, Green Environmental Section, Life Economic Division, Ibaraki Town
	Kazuhiro Mizuta	Manager, Environmental Conservation Section, Civic Life Division, Tsuchiura City
	Sachio Oguri	Deputy General Manager, Kasumigaura River Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Masayuki Ozone	Vice Chairperson (working with Hokota City), 2018 Citizens' Association that works closely with the World Lake Conference (World Lake Conference Northern Kitaara District Promotion Meeting)
	Yoshihiro Sugaya	Manager, Life Environmental Section, Civic Division, Hokota City
	Masamichi Takahashi	Vice Chairperson (working with Mito City), 2018 Citizens' Association that works closely with the World Lake Conference (Environmental Conservation Conference of Mito City)
	Akitoshi Yagi	Deputy General Manager, Hitachi River and National Highway Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Yaeko Yahagi	Vice Chairperson (working with Ibaraki Town), 2018 Citizens' Association that works closely with the World Lake Conference (Clean up Hinuma Network)

(8) Student Conference Committee

Chairperson	Mieko Kuwana	Executive Director, Department of Residential and Environmental Affairs
Members	Osamu Abe	Professor, College and Graduate School of Sociology, Rikkyo University
	Yayoi Haraguchi	Professor, College of Humanities and Social Sciences, Ibaraki University
	Shigekazu Ichiki	Secretary-General, International Lake Environment Committee Foundation
	Hideo Kawamatsu	Association of Ibaraki High School Principals (Principal, Shimodate 1st High School)
	Munetsugu Kawashima	Professor Emeritus, Shiga University
	Akira Nishikawa	Director, High School Education Division, Educational Bureau, Shiga Prefectural Board of Education
	Yasuhiro Numata	Managing Director, The Ibaraki Shimbun
	Keiichi Sue	Ibaraki Principals Association (Principal, Iitomi Elementary School)
	Junichi Tashiro	Ibaraki Private School Association (Principal, Meikei High School)
	Motoo Utsumi	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba

(9) Student Conference Review Working Group

Chairperson	Mieko Kuwana	Executive Director, Department of Residential and Environmental Affairs
Members	Osamu Abe	Professor, College and Graduate School of Sociology, Rikkyo University
	Takehiko Akabane	Science Education Research Department, Ibaraki Educational Research Association (Teacher, Yatabe Junior High School)
	Hajime Hamada	Natural Science Department, Ibaraki Prefecture Senior High School Cultural Federation (Teacher, Mitsukaido Primary High School)
	Yayoi Haraguchi	Professor, College of Humanities and Social Sciences, Ibaraki University
	Kana Hatta	Staff, International Lake Environment Committee Foundation
	Masaki Hisamatsu	Environmental Counselor (Principal, Sannou Elementary School)
	Naoto Hosoda	Manager, Ibaraki Kasumigaura Environmental Science Center
	Munetsugu Kawashima	Professor Emeritus, Shiga University
	Masaya Matsuda	Director, Lake Biwa Museum Environmental Learning Center
	Shunichi Miwa	Senior Manager, Ibaraki Kasumigaura Environmental Science Center
	Nobuhiko Nakama	Senior Manager, High School Education Division, Educational Bureau, Shiga Prefectural Board of Education
	Yoshihiro Ushioda	Science Education Research Department, Ibaraki Educational Research Association (Teacher, Souwakita Junior High School)
	Hirofumi Yamaguchi	Environmental Counselor(Director, Specified Non-profit Organization Eco-ren)
	Toshiyuki Nawa	Natural Science Department, Ibaraki Prefecture Senior High School Cultural Federation (Teacher, Kukizaki High School)

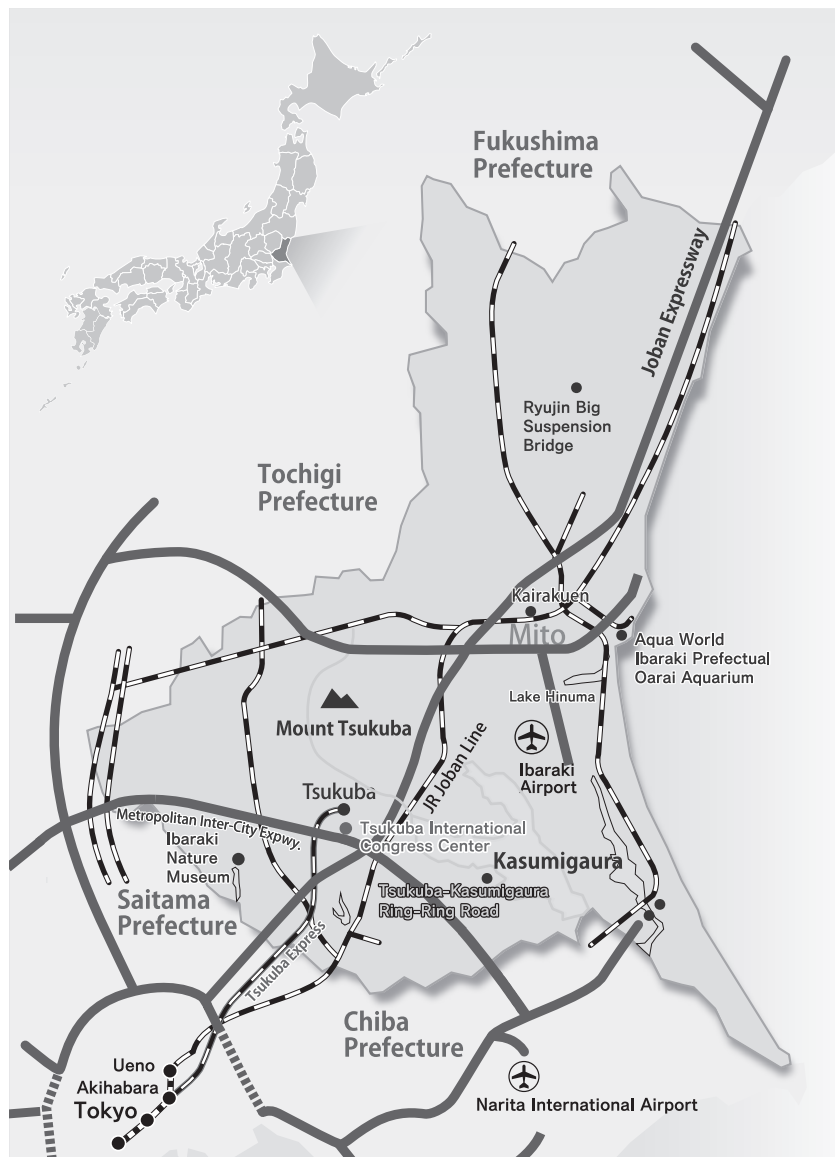
(10) Ibaraki Kasumigaura Announcement Drafting Committee

Chairperson	Saburo Matsui	Trustees, International Lake Environment Committee Foundation
Members	Takehiko Fukushima	Center Director, Ibaraki Kasumigaura Environmental Science Center
	Shuichi Matsumoto	Senior Director of Kasumigaura Restoration, Department of Residential and Environmental Affairs, Ibaraki Prefecture
	Masahisa Nakamura	Vice President, International Lake Environment Committee Foundation
	Motoo Utsumi	Associate Professor, Faculty of Life and Environmental Sciences, University of Tsukuba

MEMO

13 About Ibaraki Prefecture

Ibaraki Prefecture, home to Mt. Tsukuba and Lake Kasumigaura, is blessed with rich nature, favorable climate, a distinct history and culture, and coastlines covering a total length of 190 kilometers. Ibaraki Prefecture is a region with an array of attractions. In addition to its wealth of cutting-edge science, technology, and sophisticated manufacturing industries, Ibaraki Prefecture is renowned for its agriculture as it holds the second largest domestic agricultural output, and well-maintained land, sea and air transportation networks.



①Excursions Kasumigaura Course (P.21)



Ibaraki Kasumigaura
Environmental Science Center

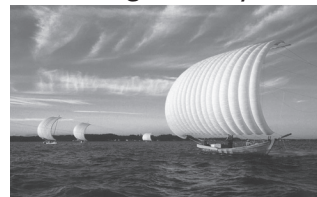
②Excursions Lakes Kitaura, Hinuma and Senba Course (P.24)



Ikoinomura Hinuma

Satellite Venues

③Kasumigaura City



Hobikisen Festival with WLC

④Mito City



Mito City Environment Fair 2018

⑤Tsuchiura City



Kasumigaura Swimming
Citizens' Festival

⑥Ibaraki Town



4th Hinuma Environment Festival:
Ramsar Symposium in Hinuma

⑦Hokota City



Hokota City: Satellite venue
for the World Lake Conference

◆ Sightseeing in Tsukuba City and vicinity

(1) Mount Tsukuba

Mount Tsukuba (877m) is a certified Japan Geopark and attracts many climbers and tourists. The summit of the mountain can easily be reached via ropeway or cable car, and from here, you can enjoy a spectacular view. Other places of interest on the side of the mountain can be enjoyed by adults and children alike, and include Tsukubasan Shrine, which is dedicated to the god of matchmaking and matrimonial happiness, Mount Tsukuba hot springs, which are effective in clearing the skin, and Forest Adventure Tsukuba, which utilizes the forest topography and trees.



**Watch, play,
learn, experience,**
and discover the best that
Mt. Tsukuba has to offer
each season!

Sightseeing information on Mount Tsukuba:

Tsukuba Tourism and Convention Association (TTCA) <http://www.ttca.jp>

(2) Tsukuba Science Tour

Educational visits are available at about 50 facilities in Tsukuba City. In addition, in order for visitors to enjoy a science tour in Tsukuba Science City, the Tsukuba Science Tour Bus operates every Saturday, Sunday and public holiday. Passengers can hop on and off the bus as they like for the day as the bus makes a loop around six research facilities.

**Facilities on
the Science Tour Bus Loop**

- The Science Museum of Map and Survey (Geospatial Information Authority of Japan (GSI))
- Tsukuba Botanical Garden (National Museum of Nature and Science)
- Tsukuba Expo Center
- Science Square Tsukuba (National Institute of Advanced Industrial Science and Technology (AIST))
- Geological Museum (National Institute of Advanced Industrial Science and Technology (AIST))
- Tsukuba Space Center (Japan Aerospace Exploration Agency (JAXA))

Adults: 500 yen, Children (elementary school): 250 yen
Children (under school age): Free

[Inquiries]

Tsukuba Science Tour Office, The Science and Technology Promotion Foundation of Ibaraki
c/- Tsukuba International Congress Center
2-20-3 Takezono, Tsukuba City, Ibaraki Prefecture
https://www.i-step.org/tour/en_tsukuba-science-tour-bus.html

☎ +81-29-863-6868 (9:00–17:00, Mon–Fri)

Tsukuba Science Tour

MEMO



河川
基金

The River Foundation

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Tsukuba EXPO'85 Memorial Foundation.

Ibaraki WLC17



<http://www.wlc17ibaraki.jp/en/index.html>



Please note that all the schedule on this announcement is tentative.

Photos by Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Tsuchiura City, Tsukuba City,
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Tourism & Local Products Association Ikoinomura Hinuma and Tsukuba International Congress Center

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